TRANSACTIONS AND PROCEEDINGS

OF THE

ROYAL SOCIETY OF SOUTH AUSTRALIA

(INCORPORATED).

VOL. LII.

[WITH PORTRAIT, MAP, TWENTY-ONE PLATES, AND THIRTY FIGURES IN THE TEXT.]

EDITED BY PROFESSOR WALTER HOWCHIN, F.G.S.
ASSISTED BY ARTHUR M. LEA, F.E.S.

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(INCORPORATED).

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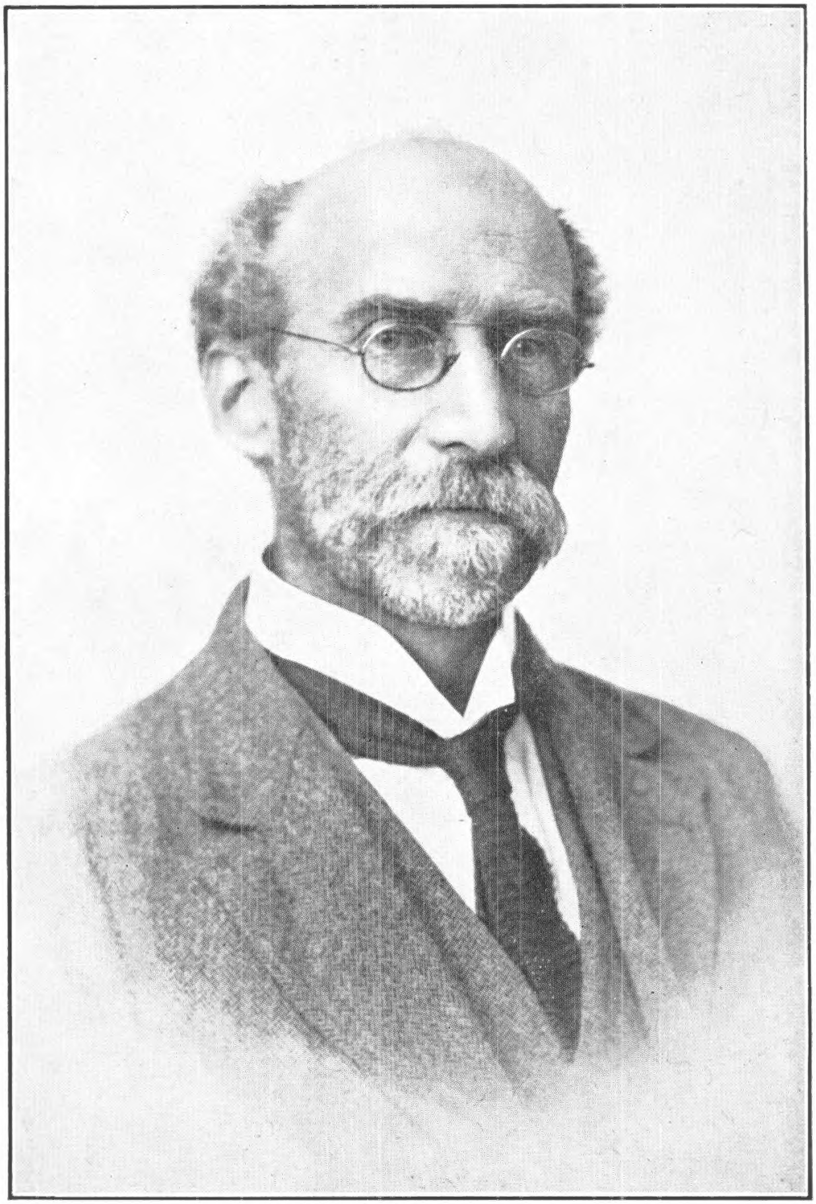
ADDENDUM.

Page 60. Seventeenth line from top, after **Syncassidina**, add **aestuaria**.



THE LATE EDGAR RAVENSWOOD WAITE.

Transactions
of
The Royal Society of South Australia (Incorporated)

VOL. LII.

OBITUARY NOTICES.

EDGAR RAVENSWOOD WAITE.

WITH PORTRAIT.

Edgar Ravenswood Waite was born in 1866 at Leeds, Yorkshire, and commenced his career as a Naturalist when he became a biological student at the Victoria University, now the University of Manchester. At the age of 22 he was appointed Sub-curator of the Leeds Museum, and a few years later was made Curator of that Institution. While in England, his principal interest lay in ornithology, but in 1893 he was selected to fill a position as Zoologist at the Australian Museum, Sydney, and there he extended his studies to other vertebrates. At this period he paid much attention to fishes; he accompanied the trawling expedition conducted in H.M.C.S. "Thetis," wrote the scientific report thereon, and also furnished an account of fishes trawled by the Western Australian Government. After spending 12 years in Sydney he was appointed Curator of the Canterbury Museum, Christchurch, New Zealand, and there, for eight years, devoted the whole of his energies to his work, becoming recognized as one of the leading Australasian Ichthyologists. He became interested in the method of exhibiting fishes by means of coloured casts, and after a while extended the practice to cetaceans, the largest cast executed under his supervision being that of a Strap-toothed Whale, 18 ft. in length. He also recovered the skeleton of a gigantic Blue Whale, 87 ft. in length. A year after his appointment as Curator he founded the "Records of the Cant. Mus.," and edited the first and part of the second volumes of that publication.

While in New Zealand Mr. Waite increased his field experience, and was connected with the following important ventures:—In 1907 he accompanied the late Lord Plunket to the Southern Islands of New Zealand, was in charge of a Government Trawling Cruise, and studied the vertebrates during the Canterbury Philosophical Institutes' Expedition to the Subantarctic Islands of New Zealand. In 1908 he led a Museum Expedition among the northern Maoris, a year later went to the West Coast Sounds to study the Vertebrata, and in 1910 was a member of an Investigation Committee which visited the New Zealand lakes. He was on board the "Aurora," as Zoologist, during the first Subantarctic cruise of Sir Douglas Mawson's Expedition, in 1912, and next year accompanied a relief expedition to Macquarie Island.

Early in 1914 Mr. Waite came to South Australia, where, until the time of his death, he occupied the position of Director of the South Australian Museum, in which capacity, owing to his 26 years of experience in museum work, he was able to introduce many innovations. A noteworthy exhibit, prepared under his direction, is a cast of a Basking-shark, 25 ft. in length, said to be the largest fish-cast in the world, while the skeleton of a Blue

Whale, equal in size to the New Zealand example, was secured from Streaky Bay and awaits articulation.

Soon after arrival in our State, Mr. Waite investigated the fishes collected by Mawson's Expedition, and during the next 14 years prepared 50 papers; the latter indicate his wide interests, for in them he noted or described mammals, birds, fishes, reptiles, amphibians and some ethnological objects. His most useful ichthyological contribution was a Catalogue of South Australian Fishes, which he enlarged later to form one of the British Science Handbooks. At the time of his death he had almost completed a second handbook dealing with the reptiles and amphibians of South Australia. He was keenly interested in the production of scientific and natural history publications, and for a decade was editor of the "Records of the South Australian Museum," and also edited the first five series of the afore-mentioned handbooks.

Mr. Waite was a Fellow of several scientific societies and a member of many clubs and natural history societies. He was elected a Fellow of this Society in 1914, was a Council member for five years, and was elected Senior Vice-President for this session.

While in South Australia Mr. Waite made numerous field excursions and took charge of three important expeditions. Shortly after his appointment he made a cruise to the Great Australian Bight in the Government trawler, "Simplon"; in 1916, in company with Capt. S. A. White, he led a Museum expedition to Central Australia, and in 1918 went to New Guinea, New Britain, and New Ireland in search of data and material for the Museum. During the course of this last trip he contracted malaria, which for ten years did much to undermine his health. He spent the latter half of 1926 in Europe and America, to obtain special information concerning museums. He was to have attended meetings of scientific committees in Tasmania in January of this year; early in the month he became seriously ill, but made the journey in the hope that the voyage would cure him; on January 19, however, he passed away in Hobart, where 700 of his friends and colleagues were gathered at the meeting of the Australasian Association for the Advancement of Science.

Science in Australia has suffered a severe loss in the death of Mr. Waite. He had many interests, and, although of a rather retiring disposition, was always willing to participate in any movement likely to advance knowledge of our fauna. He was a good companion in the field and in the laboratory, and his unfailing courtesy and readiness to assist made him many friends.

HERBERT M. HALE.

Evening Meeting, March 8, 1928.

H. Y. L. BROWN.

By the death of Henry Yorke Lyell Brown, on January 22, 1928, the Royal Society lost a member of 45 years' standing, and Australia lost one of its most honoured geologists.

Born at Sydney, Nova Scotia, in August, 1844, Mr. Brown was educated at King's College, Nova Scotia, and subsequently at the Royal School of Mines under Huxley and Tyndall.

In 1865 he came to Australia and was appointed to the Geological Survey of Victoria under A. R. C. Selwyn, thus becoming closely associated with a

number of men whose names are well known as pioneers of Australian geological investigation—C. D'O. H. Aplin, G. H. F. Ulrich, C. S. Wilkinson, R. A. F. Murray, R. Etheridge, jun., E. J. Dunn, and J. Cosmo Newbery. When this Survey was disbanded in 1869, at a moment of retrenchment, Mr. Brown went to New Zealand and acted as Goldfields Surveyor at Coromandel for a few months.

In 1870 he went to Western Australia, under a two years' engagement as Government Geologist. At this time Western Australia was passing through a crisis in its constitutional history, and was occupied with the early stages of the development of the telegraph and a railway system. Exploration of the colony was being carried out by several men, among whom were Alexander and John Forrest. In this exploratory work Mr. Brown played an important part, and it was he who discovered and named the Weld Range in the Murchison district. He prepared three geological maps and ten reports, dealing chiefly with the southern and coastal regions, and including a geological map of the colony. Mr. Brown selected the site of the first artesian borehole drilled in the Coastal Plains Basin, near the Canning River, south-east of Perth. This successful borehole was the forerunner of many that have been drilled to supply water to the metropolitan area of Perth. Governor Weld, in a despatch forwarded to England in 1874, expressed his regret that, in the then straitened circumstances of the colony, it was not possible to make the Geological Department a permanent part of the establishment. In this despatch the Governor informed the British Government, on the authority of Mr. Brown's reports, that

> "the mineral resources of the colony are very great . . . and would ultimately become a main source of its advancement. All different kinds of auriferous quartz known in other colonies are abundantly found in various parts of this. The question of payable gold is, as I have long since reported, simply a question of time."

After nearly two years spent in mining in Victoria and New Zealand, Mr. Brown rejoined Dr. Selwyn who had become Director of the Geological Survey of Canada, where he remained during 1874-5. He found the severe climate of Canada too trying and returned to Australia, where he was engaged in mining in New South Wales and Victoria and, subsequently, served on the Geological Survey of New South Wales in 1881-2.

At the end of 1882 it was decided to appoint a Government Geologist in South Australia, and Mr. Brown was selected to fill the office. He held this position until the end of 1911, and from that date to the time of his death was Honorary Consulting Geologist to the State.

No single geologist has made such extensive personal contributions to the growth of our knowledge of Australian geology as Mr. Brown, as may well be realized from his official connections with the surveys mentioned. His was the heroic age of geological exploration in a great part of the continent, and his were the first geological observations placed on record with regard to many of the remote regions of the interior. Many of his journeys were undertaken with only an Afghan camel driver for a companion, and much of his earlier work was carried out under conditions that do not exist today through the subsequent development of transport facilities.

Wherever Mr. Brown carried out his investigations, he kept before him the fixed purpose of producing a geological map showing the broad structural features of the great areas which he traversed. His Geological Map of South Australia, published in 1899 on the scale of 16 miles to the inch, is a splendid monument to his untiring zeal and his excellent judgment. This map must

remain the foundation for all future work in South Australia. To later generations is left the task of putting in the detail on the background that has been painted with the sure touch of a master hand. The same value attaches to his Geological Map of the Northern Territory, published in 1898, on the scale of 20 miles to the inch.

Mr. Brown never stressed the hardships of his long journeys in his Reports, but one can draw conclusions as to the conditions under which he worked from such records as his tribute to the endurance of his camels that travelled for 13 days without water, on the outward journey to the north-west of Ooldea, and another 13 days on the return; or the shade temperatures of 97, 101, 105, 106, 106, 108, 108, 108, 122, 124, 122, 122, 94, 84, 88, 111, and 111 degrees, Fahrenheit, recorded on successive days in the journal of an expedition in the Northern Territory.

Among the notable geological explorations carried out by Mr. Brown in South Australia and the Northern Territory were his journeys from Port Augusta to Eucla and back, in 1885; to the far north-eastern corner of South Australia, in 1883; to the Musgrave Ranges, in 1889; round the western margin of the Great Australian Artesian Basin to Charlotte Waters, in 1905; through the region in the neighbourhood of Lake Eyre, in 1892; in the country to the north of the Nullarbor Plain, in 1897; to Silverton, in 1885; throughout the Northern Territory, from north to south, in 1894; through the MacDonnell Ranges, in 1888, 1890, and 1896; in the north-western part of the Northern Territory, in 1905; from Van Diemen Gulf to the McArthur River, in 1907; and to the Tanami Goldfield, in 1909.

In addition to these major geological reconnaissances by Mr. Brown, his departmental activities included the examination of the goldfields of Echunga, Woodside, Mannahill, Wadnaminga, Gumeracha, and Mount Crawford, Barossa, Ulooloo, and Arltunga; the coal-bearing area of Leigh Creek; the artesian-water-basin of the River Murray; the lakes of Mount Gambier; the geology of Kangaroo Island, and mineral deposits in all parts of South Australia.

Mr. Brown's Reports were published for the most part in official form—many as Parliamentary Papers. In addition to these he wrote papers on the "Mesozoic Plains of South Australia" and the "Rock Phosphate Deposits" of the State, which appear in Volumes I. and XII. of the Proceedings of the Australasian Association for the Advancement of Science; and on the "Teetulpa Goldfield," printed in Volume X. of the Transactions of this Society.

No geologist in any country has commanded, to a greater degree than H. Y. L. Brown, the confidence and respect of all sections of the community—from the Governments that were guided by his recommendations to the individual prospectors who looked to him for advice and who still treasure the memory of his words of encouragement.

L. K. W.

Evening Meeting, March 8, 1928.

NATIVES OF GROOTE EYLANDT AND OF THE WEST COAST OF THE GULF OF CARPENTARIA.

Part III.—LANGUAGES OF EASTERN ARNHEM LAND.(1)

By Norman B. Tindale, South Australian Museum.

[Read March 8, 1928.]

The present paper deals with notes on the languages of the various mainland tribes of Eastern Arnhem Land, North Australia. Vocabularies of eight of the languages, which were previously unknown, are set out in tabular form. Some account is also given of the foreign influences which can be detected in Arnhem Land. The names and approximate boundaries of the tribes dealt with are detailed in a previous paper of the series.(2)

In 1802-3 Flinders,(3) during a short stay at Caledon Bay, compiled a vocabulary of the tribe, now known to be the Balamumu. During February, 1922, twenty-three young men of this tribe, accompanied by several old men, visited my camp at Groote Eylandt. They were much surprised when some of the words from Flinders' list were spoken to them. Many, amongst those used, corresponded closely with their present-day words. Lack of a common vocabulary and their subsequent unfriendly behaviour (in stealing metal objects) prevented further intercourse. Their language is related to that of the Rittarungo people; no less than ten out of the few known words having a common root. A short list of the words common to these two tribes is given below.

Spencer (4) has given a list of the relationship terms in the Nullakun (my Ngalakan) tribe. Excluding these two accounts, there are no records of any of the languages mentioned below.

Most of the natives speak more than one language; several of the older men of the Ngandi and Mara tribes know three, and one, at least, of the Ngandi tribesmen knows four besides his own. Some vocabularies were obtained by using the peculiar "pidgin" English spoken by some of the Roper River men. The northern languages were obtained by using Ngandi. The accuracy of the transcriptions was tested by repeating the native words to my informants some days or weeks after first writing them down. A few Wandaran and Allawa words obtained during my last visit to the Roper River (in May, 1922) were not checked.

The Royal Geographical Society's scheme for the transcription of place names has been adopted. This is detailed in Notes and Queries.(5) In accordance with the rules, it is necessary to state that the *ng* sound is always soft, as in *singer*, not hard, as in *finger*. The double consonant *tj* is used in preference to *ch*, even when it occurs terminally. Many words are not markedly accented. Elided vowels occur in many words; *r* in such cases is strongly accented and "rolled."

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(1) Parts I. and II. appeared in the Records of the South Australian Museum, iii., 1925-6, pp. 61-134.

(2) Tindale, *l.c.*, pp. 62-64, and fig. 23. In the description and map one correction is necessary. The tribal name "Tchambarupi" should be read as Tjambarupingu.

(3) Flinders, Mathew, Voyage to Terra Australis, ii., 1814, p. 215, *et seq.*

(4) Spencer, Sir Baldwin, Native Tribes of the Northern Territory, 1912, p. 65.

(5) Notes and Queries on Anthropology, London, 4th ed., 1912, pp. 186-192.

Foreign Influences.

Macassar Malay influences, such as I have previously noticed in the vocabulary of the Ingura tribe, and which are commented upon in the account of the Kokolango language of Elcho Island, given by Jennison,[6] are absent from all of the following vocabularies with the doubtful exception of the Nungubuyu. In all the others the few borrowed words in evidence have an English origin.

Perhaps it has not been emphasized that, even where present amongst the coastal tribes, Malay influences are superficial and almost exclusively linguistic. The words borrowed by the natives are exclusively those relating to articles of trade, weapons of offence, and the vessels in which the traders arrived. On Groote Eylandt there are, it is true, slight traces of "Macassar" blood due to occasional miscegenation during the past four or five generations, but even there, if we exclude this and the cult of the large sailing dugout canoe, the above statement is substantially correct.

The absence of true native words for all foreign articles of trade is, perhaps, evidence that the Macassar men were the first regular invaders of the isolation of the aborigines.

That they were not the first casual visitors to the coast of Arnhem Land is probably shown by the polished black jade figure of Shou Lao, Taoist immortal, unearthed from a depth of 4 feet (in soil) beneath the roots of a banyan tree at Port Darwin, in 1879. He is represented as seated upon an axis deer *(Cervis axis)* and bearing a peach, symbolical of longevity, in his right hand. The object was figured by Worsnop,[7] who obtained no details as to its name or country of origin.

Apparently it belongs to the T'ang dynasty (A.D. 618-906), and may have been brought to Australia during that period. During that dynasty the Chinese Empire (more especially during the reign of T'ai Tsung and of his successor) reached its zenith of power and extended from the Aral to the Yellow Sea, and from Siberia to Farther India.[8] Chinese civilization at this time found its way into Indo-China as well as Sumatra, Java, and other islands of the Malay Archipelago. Fleets of Chinese junks sailed as far as the Persian Gulf, and, in company with the Arabs, maintained a virtual monopoly of the world's commerce. Coins and other relics of the dynasty have been found buried in Alaska.[9]

Notes on the Vocabularies.

In many instances more than one native word is given for one English equivalent. Sometimes this indicates that dialect forms exist in the different local groups of the tribe.

Words of one syllable are rare. One, the Rembarunga word for a stone-knife, has been written as "kr." The "r" is strongly rolled and the vowel elided or absent.

Duplication or repetition of syllables is a common feature, and there are several words of the form "notnotnot" (broken) and "boiboiboi" (dry) in which one syllable is repeated three times.

The root word "marra," for hand, which is widely spread amongst Australian languages, is represented in two of the following by "marang" (Nungubuyu)

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(6) Jennison, J. C., Trans. Roy. Soc. S. Austr., vol. li., 1927, p. 178.

(7) Worsnop, T., Prehistoric Arts . . . of the Aborigines of Australia, Adelaide, 1897, p. 13, and pl. 2.

(8) Bing, Li Ung, Outlines of Chinese History, Shanghai, 1914, p. 132, *et seq.*

(9) Brown, J. M., Peoples and Problems of the Pacific, ii., 1927, p. 67, and figs.

and "komar'" (Ngandi). In most of the languages the word for finger is the same as for hand.

The Wandaran words for "curlew" and "storm" are similar. The connection between the two was explained as follows: "when curlew sing-out, big storm come up."

The words for "true" in several languages are curiously long, but are, nevertheless, the strict equivalents of shorter words (e.g., nubinda) used by neighbouring peoples.

Unfortunately, few sentences which would have revealed the structure of the languages were written down. Amongst the few recorded were:—

Mara:	Kangoindi	naijura	ngandaiaru	walanyan
	That way	I going	to spear	fish

"I [am] going to spear fish." The verb "to be" is never expressed.

Mara:	Karowoi!	karaumai
	Come here all	play

Come here everybody and play.

Mara:	Karai!	karaumai
	Come here	play

Come here (to one) and play.

The following list of pronouns is incomplete and a few forms are queried:—

	English.	Ngandi.	Rittarungo.
Personal	I	ngaya	ngara
	we	—	nangara (?)
	you	nokan	nimuka
	he, she, it	nuku (?)	—
Possessive	my, mine	ngaikanigin nganangi nangi	ngarako
	our	ngaiko	ngarako
	your	nukangu	nungumukayiki
Objective	me, myself	ngaika	ngaramuka

Notes on the numerals have been given in an earlier article of this series.

The following list includes some words common to the Balamumu and Rittarungo languages. Flinders' Balamumu words are given in the first column:—

English.	Flinders, Caledon Bay.	Balamumu.	Rittarungo.
eye	mail	meil	melja
nose	ur-roor hur-ro	urur	ngoro
hair	mar-ra	marra	[moror]*
arm	wan na	war'na	wanak
hand	gong	gong	kong
leg	bac-ca	baka	baka
foot	loc-ko, noc-ka	loko	loka†
moon	kul-le-ge a	kalegeia	kelkeiya
salt water	kaa-po	kaapo	[kapo]‡
honey	goi-ko lucko	goiko	koko

*Rembarunga word, †taluka in Injura language, ‡means fresh water in Rittarungo.

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
Afraid	korana	ngeketanakonji	nakonjikin
angry	nganar, mori	jerijerima, jerei	banganaruma, manganal
ant	raja	japo	aja
anthill (termite nest)	konja	tapul	kodapul
arm	wanak	—	—
armlet	—	manba	—
„ of opossum hair	—	—	amor
„ of cane	—	—	manba
ashamed	koranangara	ngageimen	ngabamniadi
ashes	ngarukan	manal	gongarukan
Baby .... —	yotokanyan, yoto	dakonao	bagerei, badako
bachelor	—	—	—
back	—	—	obolokoi
backbone	—	—	kokaruk
bad (also sick)	merekongo	jarungnao, jangnao	warajak
bad (wicked)	boltobo	ngekejari-ngnao	anainjara
bail out (e.g., canoe)	kapourutani	najulawara	nubungeiktan
bald (head)	—	morodi	balongmeli
bamboo (or reed)	jokolo	majawara	—
bandicoot (Perameles)	donka	tonga	wanguri
bank (of river)	kereperengara	kerepernao	kokerepere
bar (or sandbank)	—	—	—
bark (dog)	ngokon (urwartu)	barangok	angokti
„ (of tree)	kongo	kongonadala	kokaok
barramunda fish (Osteoglossum leichhardti)	meritji	meritji	imiritji
barter	—	-	—
basket	badti	yalmuru	kolpon
bat (Chiroptera)	keinkein	binbinjala	mabinbinjala
bathe	nangungara	ngaraulupa	ngauluptung
beak	ngoro	dalanao	kogiban
beard	-	-	—
beeswax	mandacha	berdinao	neberdi
beware (of being speared)	nganaru	ngeke-tjiringokori	manganaru-koyo
big	tarupal	tarupalnao	adarupal
billabong (or lagoon)	teren	nindateren, terenga	kodaren, koteren
bird	tjikaija	tjitpurukuru	ajekeiyung
bird's nest	kowal	kolnao	kokol
birth	dako mambuna	dakubolmin	adakubolti
bitch	—	—	-
bite	laongara	nginyamma	nganabiang
bitter	—	—	—
black	mulmul	ngeketamulmin	amulmul
blackfellow	yolja	bii	bayul
blaze	murumuruna	kamaranduru	kumurumurudi
blind	melbambai	baramermerdi	bakapuji
blink	—	—	-
blood	kolang	kolba	maponko
blow	—	dabura	nubudung
blunt	meremel	maradungdung	ameredi
bog	lounjo	lonjonao	kolonjo
bone	naraka	narakanao	kongaraka
boomerang	kalekale	kalekale	kokalekale
bottle	-	—	-
boy	deramo	werinmal	boderimo
brave	melgal-ngapuingara	mulaktan-gageimeiana	nikun-jikitmai
break	bakun marao	nadaikaba	adongdi
breathe	-	—	nungerungerudong
breeze (lit. little wind)	-	—	madako

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
nokokewein	yakular	yakular	nayakular	nidinawi
jerima, mojere	yumbar'war	yaramba, ngari	ayalamba	riyul
jalabeiu	ngiyala	mimbi	ora	ijar
kodapul	jardi	kongoru	—	landa
—	maya	—	wonengo	wanja
manba	mayar	kalaja	—	artan, eirta
—	—	—	—	—
—	—	—	—	—
nguyemin	yakul	or'ngajangane	mangaliangarani	ninbuli
konkongarukan	dawun	jiwa	ujiwa	naragan
mir'para	yajaja	barara	wolowolayayalinga	mibiruja, wijangi, sojuju
—	—	—	—	niulmul
obolokoi	watyulan	maleru	—	rulbukumu
kojonko	mabala	janda	—	rulbo
ngomamin	ladatji	koroa	—	aladi
bordeok	wanajonoga	weritju	goweritju	urudunawin
nukumiliwara	yetni	weriawoliji	mongoloja	baugana
boromele ameliji	nkorokoro-arabun	—	—	neibaware
—	wiyara	—	—	larawa
—	monkngan	maromaro	mowangoro	wangurak
kokel	jili	jeli	—	unarabach
—	—	—	—	dodoju
gongokkaja	ngoknembeli	ngalakama	—	unadi
konkokowo	lalkan	lalgan	woamba	umulum
nokomeritji	imairi	meritji	anyangurubandi	icigobadi
—	—	—	—	anubaiyandung, bunuyiligung
wanji	borumol	burumol	—	marin, oulmu
nokobinbinjala	—	binbinjala	—	nunga
ngongoru-mittina	badyu-ngeneyunu	leipngajura	—	nangambina
kogeyaruk	—	—	—	enadung
—	jawanda	—	—	—
muyerin	manangar	manangar	moualawar	uit
baramujerinkori	koyo-nyakabundunanga	koyo-ngandayarungoni	—	baragana
ngoloko	yamini	balwai	balwai	rungul
kolanga	wolbol	ngaruko	aworoko	wurugu
jeruk	tjolaiki	rayi	—	norudo
badakolyi	jangar	—	—	ugar
mirparabolkmin	balananyedan	dayanajanaja	—	wabuli
—	—	—	—	nugarung
ngunbein	kalni	kalngajuli	—	wanuwang
—	—	—	—	rikat
munun	kabotmain	wakmin	wangoranja	udumatj
geiwaru	lelmin	olkariyi	—	uruwurui
kokadawa kongoi	ngomnemberli	—	—	ubulubi
baruk appuji	kopotji	kabutji	—	bungali
—	—	—	—	nibadaramung
mokorai	ngoleji	ngoleji	—	olan
jukubura	narkarigenu	buumi	—	bobaya
merebereok	nyutnyut	nyeknyek	—	ulimuk
—	wajalk	wajalk	—	nalnawi
kongor ngaraka	kalawa	molkoruru	—	nagara
kokalekale	molawari	muluwari	—	ulmare
—	—	bujiling	—	budula
ngurda	lelmi	wakoru, walemar	—	ulmerinyung
nukewen-menakacha	yakular'wanda	wulayakuluyana	nadidi-niwanani	niyalgi
ngorongoromin	motnamban	motkoma	—	uading, baruwagiyuwung
ngungerengere	ngerinembeli	ngeranengama	—	nungunung
munonnon	bayinga bajaja	wiyajijungu	—	lanwun-wirik

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
bring	—	—	—
broken	yaldayadamerekongo	daimin	mawarejal
brother	wawang	moro	niaoyu
buffalo (Bos bubalus)	talatala	—	anganaparu
bug (Hemiptera)	—	—	—
bullroarer	—	—	anurudoni
bullroarer sound (also name of mythical being)	—	—	—
burn	narangara	nganyarumin	nganakin
burrawang fruit (Cycas)	ngato	—	ngato
burrow	roto	yeleyutmin	kokonjo
bush-fire	tapo, kodapo	—	kudangikujapul
butterfly	—	—	—
bye and bye	—	—	—
Call	kawuna	narakauwa	nokaudong
camp	wanga	jeni	kurere
can	—	—	—
cannibal	—	talananjal	nitananjal
cannot	mandunngaramai	—	—
canoe	—	—	—
capsize	lorubouna	lorubomin	nidirupakpin
carry	—	—	—
catch it	marani	tamangera	nuramiang
caterpillar	—	—	—
catfish	kalki	war'ma	ninguru
cave (or rock shelter)	—	—	—
centipede	mala	—	ramala
chalk (or kaolin)	kamenuko	kamanuko, kamanungu	kamanoko, kokamuunko
chest	karda	berenao	kobere
chiton	—	—	—
cicatrix	kanma	kanma	makanma
circumcision	korukadakoni	dangulateicha	nunuguldaktung
clap-hands	purnuma	narabora	naruborudong
clean	ponkawa	korukowal	adaukdauk
clever	—	naipana-kaikaninda	—
climb	—	narabetpuna	nukapeltung
close	barukomai	onyadeke	uruburu
cloud	—	—	kokonong
club, fighting-	—	waruruko	maroruko
cockatoo, black (Calyptorhynchus banksi)	darabiyangara	darabiya	kadarabiya
,, white (Kakatoe galerita)	marupor	marupor	angerik
cocoanut	—	—	—
coffin (painted log)	—	—	—
cold (I am)	moruyo ngara	nganmorumin	nangolubittin
,, (we all are)	nguruyunangara	,,	namamurudi
,, (wind)		manmurumin	mamatun
come here (to one)	kaiyo	woii	nouwa
,, ,, (to many)	,,	,,	,,
,, up (one)	berayun	barabol	bakori
,, ,, (to many)	—	barajarupol	babere
common	yindi tarupal	—	kodarupal
consider	—	ngeketala ngingawan	nganangachini yanachi
coral	—	—	—
corroboree	maraen, wakalnuma	ngolalanaranoka, yapurwurwa	gomet
cover	—	—	—
crab	merapo	—	—
crayfish	—	—	—

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
burra	—	—	—	bayarigi
komoritmin	notnotnot	—	—	malamun
nubuipu	baba	ngawayi	—	namuruyu
nokowali	wali	wali	rawali	meiwu
—	—	—	-	naguridi
miralpindi	mabayar	biberu	—	—
kunur	—	—	—	—
ngorongin	tjatjineni, jatmun nulenu	bakngancji, darauli	—	anagina
mungato	—	ngato		ngato
koyeleturuin	—	—	—	marigagi
kodappor	wobo	wadka balwai	omobor	ura
—	bardbarda	—	—	urumelijiu
—	—	—	—	urugu
burukaumin	kanamban	—	—	baniyagi
kurere, mopul	borda	ngaratpur	wadpuru	ungaui
—	—	—	—	yanawuri
talakur	wajinja	—	—	nunuyinu
	—	—	—	yangi
—	moarta, yalga	moarta, moara	moara	rungul, manaronguk
yarbuttin	deilbak	kopkoji	—	mabudungnung
—	—	—		bawaugurang
jumanga	wetkanu	—	—	balimung
—	-	—	—	luguiung
ngoropol	milindiwar	ngalangala	mitjurungu	nungnuru
—	—	—	—	garar
nokomala	ngarambili	—	amala	mala
mupim, mobeim	kabunol	ngalabura	alarkamena	laramagana, narakamen
kobere	meremere	maranga	—	oroi
—	—	—	-	emumokaro
mobinderin	borokon	borokon		ngainma
nubandariwuna	gejanji	—	olokoru	baubiaguldi
—	burburnene	borikojili	—	—
daukdauk	karayara	karayara	okraiyara	nuramamalung
jalkanguru-mengoltji	—	wabal	- -	nimarabulei
ilabirula	malwiya	malngajura	—	barudung
kakengmul	wulambur	tekai	udikai	warubaj
—	—	mala	—	—
waroruko	waruruko, koluruuru	waruruko	—	mariri, mabaruko
nokodarabiya	leradoma	leradoma	awarak	nangari
nokongerik	ngerola	ngerola	maralngar	ralna
—	—	—	—	sattara
—	—	lurugun	—	—
numarumarumin, ngogodalmin	madunjingene	takngangoina	—	mouradi, namauradi
—	madunjujilenu	—	—	namaurading
nokodelmin	madun	—	—	mareka
kokonginyabun	wakatjikono	karai, yala	kawo	baning
,,	,,	karowoi, yala	,,	,,
burubere	najinikono	—	kawonoya	wijori
buruyaru burubol	yelajinikono	- -	—	douaruyai
—		—	—	uwigiri
inbaba narubonyi	mabingeranu	—	—	nabijanayi
—	—	wajalngo	—	larami
kolangur, kongomet	leiwa	langur	aolongoro	wolangoru
—	—	—	-	baroradang
—	—	waril	-	ngarulu
—	bijiwar	jimbala	—	imalmi, dangawuk

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
creek	bongondo	bongondonao	kobongondo
crocodile	kadokado	karokaro	nanguru
crooked	merekongo	bordijarng	alungalunga
crossover	boroptunngara	—	nuboroptarukonakin
crow (Corvus cecilae)	wawa	wawa	awawa
crowd (of people)	dappal	tarupal	atarupal
cry	ngatiyuna	karonurun	barogurogena
curlew (Burhinus magnirostris)	—	—	—
cut	daktunngara	ngareiteitja	nardattu
Dance	wakalyuna	naroworoworoka	balambu
dark	konmoktenangai	kaiwalangununmin	kokonmoktin
daughter (or myd.)	toikonyouto	—	nadenkinaugi
dawn	malparar ayouna	kamalkalkalbar	kojordoudi
day	—	kekubur	kaikobur
dead	belengai koyupana	bananyarumin	niwattin
deaf (lit. sick hearing)	daaman merekongo dalaman-muktana	neke makana-mukmin	nakana-mukti
deep	lotol	mongiyangiyang	koloton
demand	koropoloni	dewanewareko	ngachiyarakaja-nunuanung
dew	kerain	—	kokerein
die	koyupana	bananyarumin	niwattin
dig	belamai	nanganguruma	nungurumtung
dilly-bag	mejeru	donbokon	worangoin
dingo (Canis dingo, wild)	warto	jamo	agawere
dirt	jolka	kojolkoiyung, jolkaman	kojolkomak
dirty	jolkamere	badajolkoi	abarutajolkoi
dive	waiwaiyuni	yaryaranarangeryiniana	ningeryura
dog (Canis dingo, tame)	urwartu	jamo	awartu
do it			—
do not know	—	nakwadiwaba	ngakodi
drink	kapolukini	najuladoma	nubungunung
drone pipe (blowing stick)	yidaki	letungman	numalkan
drop	kalkenangai	dungman	arukpang
drown	lorloryuna	julajambar-alulmin	kojakiniburudi
dry	dardaryungara	—	nikapur
duck	jingadar	jeribiuk	—
„ big black (Anas superciliosa)	—	—	—
„ diver (Phalacrocorax)	jingadar	karakarak	makarakarak
„ burdekin (Tadorna rajah)	—	—	—
„ whistler (Dendrocygna eytoni)	—	jeribiuk	jeribiuk
dugong (Halicore australis)	—	—	—
„ line	—	—	—
„ spear	—	—	—
„ spearhead	—	—	—
Eagle (Haliastur)	—	—	—
ear	talaman	talaman	makanam
east	rawarangbala	yura	raweireich
earth	jolka	—	kojaluko
eat	lokengara	danguna	nurangunung
egg	galan	kalangnao	kokalang
elbow	—	—	kokolonganda
empty	—	—	—
emu (Dromaius novachollandiae)....	wayin	urupan	urupan
eye	melja	nganjula	manganjula
eyebrow	—	nginyingoro	maminyigoro
eyebrow louse (Phthirius inguinalis)	balabalangara	minyingoro	balabalangara

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
kobor	ungolma	—	amaraman	wirik alar
nanguru (large), or janambo (small)	dardajara	dardajara	anguluri	larakula
lungulungu	kondoitmain	kondokondok	owuleomoleomoin	barawaragin
nuruborapa	lawonyulala	naonaojura	kowonyanai	nanugatjang
waparayang	wangolai	wanganangin	—	uwak
burumalko	weiga	uljari	—	arawindi
kurunurum	ngalanembeli	lolama	luluriundima	barugona
—	korabi	—	walulu	walulu
norodaitja	jarijalni	kalngamanji	—	ngangopaluna
nurulukka	karnene	karangamai	—	bawunana, amboana
komononmin	ngeitma	—	dawon	unamudi
welengegeni	—	nanabada	—	nanigi
rorowalakokojodao	-	nigandadai	—	ulubi
kaikubur	wonariri, mililambal	naonara	—	nilagadi
nyarmin	jangan	ngabaroma	nolkapa	unawi, umugu
nukana-mukmin	guardai-niba	kuarda-murdu	yolomoxami	nawanudi, neimuk
kokaluru	laliba	lalkuru	—	agararity, agardu
jolowonengutja	—	—	—	nibuyu
kongele	—	—	—	lamuli
nyarmin	jangal	ngabaroma	nolkapa	unawin
ngungurumin	galngar	walwarinya	—	aban kariman
moworengoin	wangi	bindawara	—	yciril
nokogawere	korurere	belkoru	raongan	nungarung
kongokojolkoderder	balga	—	—	upan
jepei	barapmain	—	wangoranja	warabulu
ngoigonger-yongon	limnala	—	-	—
kaja	artu	karwiri	—	landok
—	—	—	—	nurumi
ngomolkaitja	ngaingaelya	jabai	—	aremuga
ngueguna	kolnene	kolngajuli	—	angalanga
monkomol	wolombo	kolombo	—	—
jongorukangin, ngorouin	watnaiman	yurunbu	-	urupini, naudanbari
wega jingaruk-goin	naworalkanya	worungainga	—	ningumbi
kokapurk	boiboiboi	bonji	—	—
	julaiki	—	—	malkalalir
—	—	-	—	magalabil
makojokojo	ibibiwalina	karakarak	maworuboru	gundunuruogu
-		—	—	dindiera
jeribiuk	—	jeribiuk	-	—
—	—	walja	—	narukualitj
—	—	ngadorugo	—	nardogo
—	—	rattaru	—	rataru
-	—	—	—	jimindi
—	—	tewangowango	—	—
moural	ungoarta	koarta	—	—
yurara	anakadi	wangayana	—	ramalila
kojoluko	jangul	naluwangoranja	—	abanwarawara
dunguninguni, ngowin	yalunu	ngajinjin	awongama	amboi, bungui
kongalpur	apungu	waruko	oardoko	uadogu
-	morinji	morinji	—	mulun
—	—	—	—	warai
ngurundui	kanajaja	juruiwiri	—	wain
monganjula	ngolor	makuru, mago	—	bakalang
muminyingorong	ibechibechi	jaminjamin	—	munjun
monkominyingoro	—	balabalangara	—	munditj

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
Face	—	walamangokori	gowolmor
fat	jawol	konnao	makon
father (includes father's brother)	bapan	nyaragene	ninyarang
fear	—	—	-
few	—	wangarideke	mamoruko
fight	bonamere	narabuidina	baboidina
fill it up!	—	najululura	nukujurudong
finger	kong	langin	komar
,, nail	—	birninao	gobining
finish	—	nareboa	kokarodi
fire	koruta	ngii	kodangi
firestick	torupo	duruman	gongoni
firewood	bal	pal	gobal
fish	koiya	jein	ajen
fishing line	ureru	—	.
fish-net	maijambar	bokor	mayambal
flat	—	—	abelkbelk
flesh	dango	dankonao	kudangu
flood	warajara	jorujoru	mawarajara
flour	kandere	kandere	makandere
fly (a)	botja	bot	abot
flying-fox (Pteropus)	warinyu	warinyo	awarinyu
flying phalanger (Petaurus)	--	—	--
fog	karain	kerengnao	kokeren
foot	loko	janga	kodeng
forehead	janamba	—	warumo
forget	—	nawarakamin	ngaijurakadi
four	—	—	—
frog	—	koutwong-koutwon	anardi
full	tarupalmuka	nawarudapalmin	mabalbaldi
"full up" ("Pidjin" for plenty)	tarupal	tarupal	akali
full up (satiated)	—	nawarudarupalmin	nawarukaletin
Gammon (lie)	yuiryunani	nginyurumin	niuruduni
girl	nading	baramarinmarin	bomalamalapa, lamarinmerin
give	koloporoni	dadewana	nuragan
go	—	—	—
go away	waneni	inyiongura	nurudong
goana (Varanus)	wokoi	wokoru	abijai
good	namakulingai	ngeketama, mamein	aburuma, imaktin
good bye	belemoka	—	kalajaboin
goose (Anseranus semipalmatus)	languna	jamoi	langunayung
grandfather	—	noringene	nimurdi
grass	rolpoituru	rul	kunoto
grasshopper	—	japoreidein	japoreidein
green	yota	kurukuwal	akolkol
green ant (Oecophila smaragdina)	malak	badamalaki	amala
grinding stones	gomal	gomal	kokolchi
,, upper	—	—	—
,, lower	—	—	—
grog	—	—	—
grow	damulbituna	yaratmin	yaratmin
Hair	jamoi	moror	majere
hair-belt	morton	malberi	ngaderin
hand	kong	ngarin	komar
happy	ngorupin	yolmamin	ngayorumaktin
hard	—	drerdrer	aderder

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
gowalama	ngoloru	makuru	—	yi
mumena	joma	ngaitpa, joma	—	mangatj
nomok-konowi	goni	nababa	—	bubba
—	—	—	—	numudanawi
nunun-ngulkurmuk	mandiwikayi	wanginwangin	uluwanginwangin	ungulawa
moropoiuna	yombara	rangnerikalana	—	ambomjina
nukorutinga	jinjini	—	—	boiyappan
kongarin	moritji	moritji	—	marang
kobining	roro	lakarau	—	launar
ngwoimin	bingamon	—	—	baojadoga
gongoi	obo	wadkar	aombur	ngura
konkongoni	marama	bodalan	mayanga	uduamun
kokolering	wobo	wadka	—	rangak
ujen	aka, balguru	walanyan	awalanyan	ujija
—	arurbi	jibar	—	uteri
—	yambal	yambal	—	nanja
lepel	belmain	belmin	—	olabalami
kodango	gombi	gombi	—	langu
mubalkar	maraman	waraiara	—	nugu
mankokandere	kandere	kandere	—	kandere
bot	wondel	kondel	—	omom
nokokimbpat	korobaba	koreala	—	maibangari
—	—	—	—	yokkongbo
kongele	—	—	—	wugi
konyaman	deanga	jarubo	—	mon
walama	melendi	melendi	—	inak
mumenmukmin	mokmaiman	—	—	narundalabi
—	—	—	—	umarununbaj
nardi	jolgo	nardi	raiulwa	dabararuk
balpalmin	yamu	jari	lutkinga	umedaui
ngorungolkomin	wiga	uljari	—	awularang,dala
ngoworutmin	beringamban	beringana	—	niwalaraung
inyuarupmin	wululendi	ol'lelirindi	—	nukuali
jokowelenge, mir'para, bulobulo	gerea	barar, janawa	—	mananung, nalagi
wunidura	memimbi	—	—	nibi
—	—	naijura	—	barumang
nginyarabun	wenya	uia, tjuiola	jiandi	boroman, nirumanung, barumung
takkal	gerara	wadabir	—	okoi
yalalamin, makobamma	jomar	yomara	gomaranjara	ambalaman, uril
jaboin	moro	guda	wiya	wia
nukulanguna	languna	languna	—	nunma
nur(d)urro, durdo	kanganggo	ngamori	—	—
konoto	jeran	wiji	—	mada
nukujarureidein	jatpatpulunga	jabodeindein	—	daburuk
nokodaukdauk	—	korokol	orukoru	madananulnalui
—	—	—	—	mararang
kokolchi	—	konji	—	morir
—	koyaoja	—	—	—
—	wolchi	—	—	—
—	—	—	—	unigi
yaratmin	kalalwinya	—	—	warading
moral	binjor	mudur mudur	—	mong
momangaral	wedega	udiga	—	laribiru
kongarin	moritji	moritji	—	marang, gura
nguijolmamin	ningaya yomal	yumarajula	yomarunginga	mundu
—	—	dirdir	—	—

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
hat (corroboree)	—	kajakaja	kokajakaja
hawk	—	—	—
head	—	—	—
head louse (Pediculus capitis)	micha	mi	ami
hear	—	—	—
heart	dor	—	kudor
heavy	nemnemdungara	ngaiyowalnamin	angotngot
heron, nankeen (Nycticorax caledonicus)	—	—	akomolo
„ reef (Demiegretta sacra)	—	jer'kolokolo	kanandara
hide (to)	konjiwirechina	nginyuinditina	nuyindinyang
hill	ngorojeiryuna	ngoronao	kororon
hit	barupo ngoni	dzabuna	nuwaguludong
hold	-	-	—
hole	dopon	kayeleyu	kuleye
honey bee (native)	—	—	nibot
hook, fish-	ureru	—	—
hot	dardar mangara	ngadadarumindala	ngadarudarumo
humpy	torokol	torokolnao	kodorokol
hungry	marujayunangara	najula-nginyarumin	ngaialuti
hurt	—	—	—
husband	badadengmere	—	nabadaderemowei
I	ngara	—	ngaya
Insect	—	—	—
iron	dawun	jambaka	jambaka
is it not?	—	ngeke	—
island	—	kambanao	kambalurunga
Jabiru (Xenorhynchus asiaticus)	-	—	iganji
jealous	-	marnakundakan	baberijaippam
jerboa mouse (Notomys)	—	—	-
jump	urokurokni	narworoworoka	nuarauptung
Kangaroo	tjaitja	goein	aderu, aderik
„ big	urupungula	- -	—
„ plain	luwar'min	karichambal	karichambal
kick	—	—	—
kidney	bandi	bandi	kobandi
kill	langongarakoyoppana	ngamerea nganyaruk kanging	nganuramdinuwatti
kingfisher (Dacelo leachi)	korobo	bandanga, kalmaokokman	akoppou
knee	—	—	komor
knife, iron	—	kajet	akajet
„ stone-	waretambal	kr	wareman
knock up	bayakteri ngara	ngabayakmin	nabayaktin
know	—	ngakoabolkoi	ngakojanachibolkoi
kulaman, flat (wooden dish)	- -	-	-
„ boat-shaped	—	-	
Lame	merdekongo	nekejarungmin	barijaktin
laugh	dordoryuni	nadawakwakka	nukurimiang
leaf	manjara	manjar	komanjar
leech	jimi	jimi	ajimi
leg	baka	tarupi	gokanda
letter (book)	—	—	—
lie	yuiryunani	nginyurumin	niuruduni
lift	—	—	—

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe.	Ailawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
mokotkot	kajakaja	kodari	—	ugudari
—	dedejar	—	—	gorujojo
—	—	marangoro	—	—
nokomii	mondol	delwul	-	mi
—	—	—	—	nawongina
kudor	kapuru	bulbul	—	wurui
nguyolmamin	kolmain	walmin	walmaia	neimundul
mangadebedebe	matpangar	matpangar	—	nalgu
nokokandaru	dalaraia	dalarala	anuuma	marala
nokomdangana	yolknene	darukngano	—	angojolobi
—	kodaro	manoga	—	wabin
ngukulmin	yangana	kalikomanji	—	banurayang, barawadung
—	—	—	—	bawuwanagang
konkuyele	ngugalngar	wujuja	—	gara
mubot	wondel	kondel	—	ngokol
—	arurbi	kaulbi	—	bigangi
ngoladpo	woinenene	tartnama	-	ngaradarumi, udadamun
konkojolpan	wambi	baran	—	umuul
maraolmin	wajarungene	wayarungayanga	—	amariadi
—	—	—	—	banwubina
badakelmarinyi	kaikainganji	—	—	nakulku
	—			
ngaia	—	—	—	—
—	—	—	-	kankanyung
jambaka	jimindi	—	—	bulayi
—	nginyane	nginjane	—	—
gokanduyun	lolga	lolga	—	rilgi
tjonaran	—	—	—	ungi
orangminmin	merknanya	walmin	—	niulibali
—	kolotji	—	—	orandenden
nginworoaoka	yawinya	werukkola	—	babin
urkulin	warubaro	kerumo	—	ngaruko
—	kerembo	—	rakerumo	lulagu
kanaruki	yarak'la	jadokal, jarukual	radaroga	ajabul
—	—	—	—	banuwanung
kobandi	—	bandi	—	erewo
ngumare gnunyarukangin	werugil	ngandayari ngabaroma	—	mambarai
bandanga	—	koral	-	ural
kobon	mirimal	mirimalu	—	lan
nokokajet	jimindi	jangane	—	maragi
mujara	wanyin, wareman, korowalya	wanyin	—	laga, moutoluk
nokadarumin	nelknala	ngayelnganga	—	amawi
ngokoijalga	ngayelyanibi	ngaiyalya	—	umaaboe
—	lengar	kulaman	—	—
—	obonga	—	—	—
bordubordeok	dingaldingal	dingaldingal	nabujur	nibabadi
nuruwakwakka	akoakmin	yayajujungu	—	bunganung
kobel	lerin	lerin	—	wugiya
jimi	amakama	migamiga	—	mattal
kokanda	dowola	duula, gangon	—	larupi
—	—	—	—	ubiba
inyuarupmin	—	—	—	niawali
—	—	—	—	barulalagang

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
light (of torch)	—	—	—
,, (in weight)	roro	ngaiyalangrormin	abegebege
lightning	maimaiyun	kamaimai	maimaidi
lily, edible water- (Nymphaea stellata)	dattam	dattam	madattam
,, damper	ngorokja	ngoroknao	mamelingen
,, seed	dattam	dattam	madattam
,, root	wawandal	—	mabalkol
,, stems	—	—	—
lip	—	kolanao	kokola
listen	—	—	—
little	yutokainyan	dakonao	adakokaina
,, while	—	—	konjoktongawin
live	—	—	—
liver	ngaltir	marlok	kudeo
lizard, blue tongue-	kolmoro	topolon	akurumurlo
,, frilled	jangur	jangoru	ajangoro
,, water	doruborong	molomana	ajaruka
long	jakakurtimai	jakageiyang	adokmai
long time	walekuru	mitjinda	yanatji
,, way	baruko	wonyanattin	parokikmai
loud	nyolonyoloyun	narayonga	nukaudong
lubra	nadinwai	tinkapul	wadea
lung	jenberer	wodowodo	woroworo
Make	mantun	namaninya	mamaningtung
Malay	—	—	—
man	—	—	—
mangrove	—	-	—
mantis	—	—	—
many	—	tarupal	akali
march fly (Tabanus)	barti	winyinwinyin	aborol
married-man	badadingmere	bardadingui	badadingui
marry	—	ngabadadingi	nabadadengui
mast	—	-	—
mat	—	—	dandea
me	ngaramuka	nginda	ngaika
meteor	—	—	-
milk	—	pipi	kongam
mine	ngarako	indakan	ngaikanigin, ngaiko
moon	kolkeiya	—	nikurunga
morning	—	danitanin	konmokobi
mosquito	barti	barti	abardi
mother	—	ngalan	nanganang, manang
mountain	doron	kokoloyuru	kororon
mouth	—	dala	kodakula
mud	—	lonjo	kolonjo
murderer	—	barajerima	bangayangleri
music	—	—	—
,, of clapping boomerang	dardar yuru	—	nabelpeltung
,, of drone pipe	letunkango	kangonyao	babupbup
,, of two sticks	—	—	—
my	ngarako	—	ngaikanigin, nganangi
Native black plum	—	—	maundan
,, companion (Antigone rubicunda)	banami	bodolko	banami
,, cat (Dasyurus)	ranyuluk	kachurwumbana	adangidangin
,, fig (Ficus glomerata, etc.)	—	wanwan	mawanwan
,, pheasant (Centropus phasianinus)	—	—	kurundula
,, plum (Buchanania)	beriki	beriki	beriki

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe.	**Allawa** Inland Tribe.	**Mara** Gulf Tribe.	**Wandaran** Gulf Tribe.	**Nungubuyu** Gulf Tribe.
—	—		—	ulati
roro	bolbolbo	bulbuldu	bulbul	neigaga
mameimmin	mimimnembele	yaminji	—	nomindı
mudattam	yalbun	yalbun	—	ayak, iyak
—	jangoyala	jangoyala	—	udanagun
mudattam	—	yalbun	—	—
momboron	dola	dola	—	wudan
—	barana	badu, tjautjau	—	
kodala	—	injawanda	—	lagula
—	—	—	—	bawarumbali
miripara	badjadja	geiro	eiko	wirik
ingunbugi	wonyaki	ngorinda	—	udaj
—	—	—	—	nibuli
kokewe	ngadowado	—	—	aman
nokokolomolo	jayawuru	waduwadu	—	liruk
baltjura	kabala	dalngonji	—	waltjuri
barangari	mangar	marangaranga	—	kalamu
ugengen	rokarala	rokalara	alokarara	ujamayalmaj
ipunda	wandinmyu	kayari	—	ubanlugatj
kokodaken	ngalbi	nanai	ranyanai	unyanar
ngurunyawa	ngaikanji	dawadawaya	—	amadajun
wurwurunga	wadea	ngerea	—	minmanung
koutjal	ngerenembele	ngeruminy	—	anderi
mumumaninyan	yomaranu	jarangajuju	—	goagini, momandi, barumaiguna
—	—	—	—	tjudaka
—	—	karirimal	—	—
—	—	—	—	unnar
—	ogorowarena	—	—	
ngolko	weiga	balwai	ulinjilikari	dala
bolor	worala	borala	—	walar
burubatabolobolo1, geiwa	kondiyar	urumaigula	—	ningimanu
ngobadabolobolo yi	yelemaikola	neranu	—	niginanu
—	—	—	—	bagajalyarar
—	—	boromol	—	barar
ngaika	nginadi	ngena	—	ngaya
—	—	dilwanja	—	—
kojenge	ngabolo	konyan	—	mime
ngaikanigin	ngabainya	ngena	—	ngayawi
mangal	wadangari	dangadanga	angaladi	malindi, labuma
monomonoindo	merendinibogi	—	—	namugigach
nokobarti	mola	mola	—	mola, muul
jumanang, maima	goja	kajeri, nkarinya	—	ngarika, naregung
konkoyun	—	—	—	wabin
kodala	—	ngandal	—	ramaton
monkowaitjal	wajal	—	—	manauna
nokojerima	yombar'war	molongoa	—	nurung
—	—	—	—	balamurung
nurulerleri	—	—	—	naninbaregi
—	ngalaengalaenu	nalayakanja	—	lambilbilik, soluru
—	—	—	—	wialbilik
ngaikanigin	—	—	—	—
mowom	—	—	—	
bodorulko	darukmanji	kodaruko	—	wondaruta
nyolok	wanambira	manambira	akaburunguna	orulambaj
mowanwan	wuninyara	guningyara	—	nungarata
bukbuk	—	bukbana	—	obok
mongotji	—	yimuru	—	monjoi

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
navel	-	nanar	kongorol
near	kalki	iningianaburu	nurudongburuburu
necklace	—	—	mamangororo
needle	—	—	—
net	—	—	mabuku
new	niuta	barakurukual	akolkol
no	bai	ban	mai, korak
,, good	merekongongai	—	warijaktin
north	ngororoi	yube	ngorich
nose	ngoro	—	kogiban
nothing	yukango	waba	ayakko
not true	yuruyuruni	inyurumin	niurudi
Old	balai	mitjinda	nayanatji
,, man	mori	—	jaulba
one	—	—	—
opossum (Trichosurus)	mirtiwere	do	ado
other side	—	—	—
our	ngarako	yandakan	ngaiko
over there	ngorokoi	koda	nakeman
oyster	—	—	—
Pad (native road)	wandangoporo	—	koyol
paddle	—	—	-
paint oneself (to)	burupuru-kananuma	—	burupuru-kaena
paperbark	kongo	kaja	kogeje
pearl	—	—	—
,, shell	—	—	—
pelican (Pelecanus conspicillatus)	—	kolkol	nikolkol
penis	—	ngola	mangol
pick up	—	—	—
pierced nasal septum	—	—	gulayi
pinch	-	—	—
plain country	towarngara	dowar	gowarara
play	wakaryurulngalema, wakalyuru-warema	narakuluka, naradakaluka	katjalmiang
plenty	yindi tarupal	nawarudalpalmin	bakali
plover (Lobivanellus lobatus)	-	—	—
poison	merekongo	—	mawarejal
porcupine (Echidna)	manapun	jerimanga	manapun
pretty (face)	—	—	-
pubic tassel	polnyin	tjuttjut	kojutjung
Quail (Turnix)	-	-	—
quick	—	warewarekodala, wariwarikuyu	yarakaja
quiet	yelkei	yowatta	ngotnurudong
Rain	nial, nialkja	dula	anyal
rainbow	amoi	moitjman	omotji
rat	rajerikin	jerikin	ajiriki
red	ngeringerika, ngerimere	ngerei, ngerenao	angeringerika, angerewei
red ochre (ruddle)	maingo	merawongi	amaingo
reeds	jelibijelibi	majawara	majelibijelibi
right	jonkolomoka	ngakoa-bolkoi	nako-bulukui, jaboinkala
ripe	—	-	—
river	bongondo, ngaiyangula	bowanao, palupa	kobalupa
rock	jondo	jondo	kojondo
root	wandal	wandalnao	wandal
rope	tarupa	—	—
rotten	barupa-ngauton	nuru	ananjara
round	—	—	amujur

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
—	—	—	—	mala
buruburungindura	wolambur	tekai	—	warubatj
momangororo	mangarururu	ngareru	—	muramura
—	-	—	—	jaru
monkomanapa	yambal	—	—	umuni
burukolkol	wonyaya	makowara	—	ugatoar
—	wadat	wayi	—	lalabin
ngubudeokmin	wenejenoga	wijuna, nuguya	—	aladi
ibai	lengidi	imiana	—	umbiala
kojer	goyomor	ijiri	—	imoruk
kacha	mandi	wariya, maloi	—	wari
inyuarumin	wulwul	wolowanga	—	—
yippunda	kodarinjina	—	—	ubuga
ngoboila	olkolar	jaulba	—	wopunugaj, yungunyang
wongin	—	wargin	—	ajabungich
tukula	—	kojani	—	ulambak
—	—	—	—	agagala
ngaikanigin	—	niia	—	nungura
konberenan	nolo	—	.	banu
—	bondobondo	jorjoruk	—	laramin
koyol	mangan	jarubo bakarukumo	—	adi
—	—	maiwatjawa	—	miaja
nuburupur-katjena	kabunuldunene	oborumakalan	—	numbararena
kokat	—	yalan	—	lewa
—	—	—	—	oumbakalang
—	—	bolabola	—	mutiara
nukubaiya	melengoara	balubalu	—	mapulu
mujimbi	—	jagul	—	munwuyi
—	—	—	—	bawulalagang
—	—	—	—	—
—	—	—	—	banurinung
konkokowarara	woranjinya	woran	—	lamumulung
inkaluka, kokalukmin	woronembele, woromimbi	karaumai	—	ngamboikina, nagarngina
molko	weiga, woika	jari	—	arawindi
—	—	—	—	willi
—	—	werichu	—	muwuya
latja	molobiri, wobola	molulberi	ngerumanga	yoromanga
—	—	makoyomari	—	—
kotjout	maruban	tjuttjut	—	mindi
—	—	—	—	gawululuk
yarakaja	joruga	karitjal	—	mangolongolok, bangalangalang
ngotminya	lalwinya	morinmorin	—	uwuldi
moe	michal	gobijiji	—	anbana
nokomotji	yadalkonjama	widagama	—	maring
rurto	kolotji	prutprut	—	ludi
ngerei	jilenmain	jelinmin	—	nalnal
maingo	maingo	donyodonyo	—	loni
—	wiyara	—	—	larawa
nokwoyijalga, jaboinwoi	yomal	—	wiiga	lala, mayauia
—	—	—	—	larung
konkobor	walba	balba	—	alar
koberin	ungodara	manoga	—	noka
kodaktjarri	duula	monda	—	laomok, kakil
—	yibar	ngadorgo	—	nardogo
wukor	arwa	—	makarua	uril
yoro-malaja-malaja	namul	—	ubelmain	udawaraumi

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
rub	—	—	—
run	yotoruni	narayuta, nginyutta	nubungan, nuboruporutong
Sail	—	—	—
saltpan	—	—	—
saltwater	—	—	mattala
saltwater country	marakulupuinyu marakulupulu	kurupulukan	bamalamatalain
sand	tambor, ratjar	damburman, jolka	madamburu
sandfly	winyinwinyin	bolor	awilwil
sandhill	tambur-nurpitnara	rachanao	kororon
scratch	—	—	—
scrub (low jungle)	—	minicha	marapdap
sea bream	—	—	—
search	—	—	—
sea-weed	—	—	—
see	—	—	—
shade	konyol	joroi	kojoroi
,, hut	torokolya	torokol	kojoru
shadow	konyol	—	kojar
shake	—	—	—
shallow	karao	jolakadao	kokadao
shark	—	—	ajenma
sharp	merenamakuli	merama	ameremap
shell	—	—	kongalan
shield	—	—	—
shooting-star	—	—	madeleledi
shore	—	—	
short	kurti	kolonao	agotikanya
sick (c.f., bad)	bolalmanji	ngekedakali	nuwarejal
,, (stomach pains)	—	—	—
sinew	—	—	—
sing	dardaryuruni	—	narukowalgan
,, (encompass death by pointing and magic)	dardaryurunuma	nawarukanawaikana	narukowalgan
,, out	waturuni	inkawayo	nubarakaudong
sister	yapan	yappa	nakorai
sit down	duryuruni	ngindura	nadurudong
skin (to)	—	—	—
,, (human)	badakolameri	kolanao	kukula
sky	topolk	dopolkman	madopolk
sleep	uringara	ngayngiana	ngainijang
slow	yelki	yeleknorurongura, mapuyu	mapui
smell (to)	—	—	—
smoke	japulyun, bolbolyun	nawolnyamma	koban
smooth	awuranka	roanka	akelekele
snake, harmless	manangola	ngara	manangola
,, poisonous	bar'ko	jerei	kobar'ko
sneeze	—	—	—
soft	—	delkdelknao	kokanjalkanjol
son (or my son)	ngarakoyouto	ngindakan walkolngini	ngaikoadako nganangi
sore	tjeitjei	momok	kojetji
sorry	liadelyuna	ngaiwaljarungmin	jakaya-ngakodelti
south	bakala	yulan	bakeitj
speak	wangani	nara-nyauk-nyaukka	ninyauknyauktong
spear (to)	—	—	—
,,	warawara	barranga	makami
,, barbed	—	—	—
,, fish	dokol	wulmuru	—
,, stone	waretambal	wareman	mareman
,, wire	—	wulmuru	—

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
-	—	—	—	baiarabi
nguduruein, inturuena	keitkinya, keitjena	daiamanji, natkola	—	ngambo-manjarupan, baiyabang
—	—	tumbala	—	tombala
—	—	minitjaru	—	lananitj
monkowarti	ngaloruloru	maloruloru	malakayak	lakayak
—	gorongaranjinya	korongaran	-	-
munkudambur, kodambur	ngeritmain	ngajan, naluwa	—	mangarak, alil
nokowilwil	rewoi	rewoi	—	miliwirin
—	—	—	—	madabung
—	—	—	—	banalanina
-	—	ngaladkara	-	laganal
	—	—	—	telyanku
—	—	—	—	baragunabarumung
—	—	maja	—	uriruritj
—	—	-	—	barunai, nanai
konkojoroi	ngorokon	koladu	—	wanauradi
kojoroi	ngorokun	koladu	—	wobaran
—	—	—	—	malnitj
-	-	—	-	bawuyajalung
kokadao	lalibawanda	bonji	—	ababil
nokojenma	rongorin	jinma	—	ajar, lanaguru
merema	molgan	mandarara	nayaramba	barubana, marangaritj
kongolambak	—	raba	amutiara	nungi, walgu
—	—	—	—	dul
mowarangmoraba	delngala	dalakanburdu	-	warungun
—	—	—	—	awubul
makodaruk	jungulu	jaungbung	jawongokainya	damuruk
yabayaban	jangal	ngabarungamanji	olonyaka	neiyarangari, nilunguranung
—	—	—	—	niwababina
—	—	—	—	manamabi
nokowane	warenu	—	—	bauraung
nokowane	wariyilenu	waralikanja	—	nebigarayang
jukawa	kanembeli	kawama	—	madi
jiapa	anbababa	ngalali	—	amuruyu
indura	yapka	kaitkumi	—	ambupura
—	jarjarngani	raojeli	—	—
kukula	lerubi	nyadin	—	warikulok
momingur	ngondoro	kondoro	omala	mieri
ngoyongona	yananene	yanangajana	—	anjinga
mapui	balbalbi	yainma, maramara	—	orokori
—	—	—	—	uangjangnun
kowolbori	jungungu	jungungu	obonjol	uobuli
nokokelekele	—	-	—	umbarar
ngondi	kondayari	tawara	—	maring
yaworukarker	indangalere	karemola	—	marakaritj
—	-	—	—	naragibang
kodepdep	—	norugo	—	ararnini
mirparangene	—	ganija	—	waruya
komomok	bokolyoru	bobo	—	tjeitji, gigi
nguramaru-bureokmin	ningaya wenichiongene	jalkar'-werichu	nganyanginya	nanuanaiu
yuwalam	wedi	wayana	-	wakianga
kokoinyaukyaukka	ngalmimbi	ngalama	—	baiyambung
	—	ngandaiaru	—	—
barakal	-	dongal	mayalungu	laruta
—	ngarukitpa	ngarukeitpa	-	lalungu
	barakal	barakal	—	riangil
mujara	wanyin	wanyan	—	laka, lar'ga
-	-	wolumoru	—	ugana

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
spider	—	—	adulul
spit	ngalja	ngal	gongal
spoonbill (Plataleaflavipes)	karala	pulupulun	kokarala
spread	—	—	—
,, sail	—	—	—
stand up	tareni	indiana	nujakatinyan
star	dopolk	topolk	natapolk
steal	—	nakurumia	ngarakurumai
stingaree (ray)	—	—	kamboma
stomach (or belly)	kolon	gei	madolo
stone		jondo	kojondo
,, axe	—	—	—
,, knife	waretambal	k(u)r (kr)	mareman
,, head of spear	waretambal	wareman	mareman
storm	ngondo	walulu	malulu
straight	oranga	bordima	ajongola
string	tarupa	balko	mabalko
strong	derder	ngaiyalangderdermin	ngaderder
stupid	kanba kanba	kobijarang	niwarijak nimakmai
suck	—	—	—
sun	alere	mutta	nawatji
surprise, expression of	—	—	yai !
sweat	—	naoburumin	naworongorodi
sweet	mainamakuli	ngeketamaima	amalar
swim	wariyungara	ngaworuwara	nawaruwarudong
Tail	koitpol	molona	molona
take	—	—	—
take it	—	—	—
talk	—	—	—
teeth	lanar	kiyar	kuriibal
testicles	—	waraman	maborongor
thigh	darumorolu	—	korangmele
think	—	—	—
thirsty	kapokoyu-panangara	najula-nginyarunun	ngajakuatin
thread	—	—	—
three	—	—	—
throat	kolok	mangaloruloru	mangaloruloru
throw	urutaijungara	nawara	norageiktan
throwing stick		mandoro	abondok
thunder	bandaema	bandaema	bandaema
tide	—	—	—
tired	dorodoroyungara	ngabayakmin	ngadorodorodi
tit	pipi	pipi	kongam
tobacco	tambaku	tambaku	tambaku
today	katura	tawa	tawa
toe	—	—	kojewaru
tomorrow	kodarupoi	tanitani	konmokobi
tortoise, freshwater (Chelodina)	kaiwal	—	janoga
totem stick	baruko	mayaka	mamayaka
track	wandangoporo, berla	yuwulman, berla	mawanda
tree	danda	bolo	kodanda
,, beach sheaoak (Casuarina equisetifolia)	—	—	—
,, bloodwood	—	domolo	kodomolo
,, ironwood (Erythrophlaeum)	minyarungara	jeripara	maniniyar
,, kulabar	walan	walanjan	kwalan
,, lancewood	—	—	—
,, leichhardt pine	dobal	dobal	madobal
,, milk	—	pulupulu	kobolopolo
,, pandanus	konjak, konka	kongar	marok, makonja

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe.	Allawa Inland Tribe.	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
nokokar	warabawaraba	warabawaraba	—	alil
gongal	amal	jakar	—	lakur
—	bolonbolon	bulunbulun	—	louiya
—	—	—	—	bayajarung
—	—	—	—	banuwadarijung
indagan	jerini	babaiula	—	balanga, balalagi
mominguru	jingitji	kamerinji	memiri	miyiri
nuwoitmanga	ngenyingenyi	korowaranga	—	nimangi
—	—	ngoingoi	manuwara	rabayaba
moworo	ngonjal	nganja	—	kolmo
koberin	kodaro	manoga	—	noka, malara
—	wanjuru	—	—	gajanar'
mujara	korowalya	wanyin	—	moutaluk
mujara	wanyin	wanyan	—	lar'ga
munguwalulu	bayinga, nangoreima	walulu	walulu	udawun, utani
jongolo	yumburuitna	dunbur	orurunbunmain	runagundruk
—	yibar	jibar	—	mapun, uteri
buruderdermin	yerenga	rerireria	ngalngalea	watawatad
barubok koikoi	nukowartawenichinoka	kowartawerichu	nayarubi	nanalaladi
—	—	—	—	nau-uenjang
moatji	wonaru	konaaru	ngewerungewerungi	aleiru
—	—	yakkai!	—	ya!
ngolatpo	amal	ngorowanyin	amuripur	uwurij
mainma	yomar	inyarubanyaruba	maniaruniaruba	lanilagu, lamemalung
ngongoia	nguinala	woingajura	—	nangamana
monkojikur	jikuru	jikur	—	rabara
—	—	—	—	bauyaigi
—	—	—	—	baurumigi
—	—	—	—	baiyambang
kugiyaruk	ngoyoru	kuyuru	—	ra
monkoder	—	laribirij	—	muyi
kotarupi	galappan	dola	—	mango
—	—	—	—	ariumawalang
nguenyarmin	dangnenene	danganiji	—	ngaurigulti
—	—	—	—	mabu
puramuruko	—	jari (= many)		ulangbatj
komangaloruloru	ngondorungondoru	ngondorungondoru	—	aluak
nuwaru	yatmi	tokojele	—	ambarakan
monkobondok	banban	ujula (flat)	amangal	mangal, wanduk
		ngalega (round)		
bandayama	awaran	yaminji	—	ngororoa
—	dedmanja	dedmanja	—	magarena
ngodatmin	nelknaiman	jelunganga	—	mangaui
kojenge	ngabulu	konyan	—	mime
tambaku	beka	jangangu	—	tambaku
ingon	wonya	nala	—	yeiembatj
ngele	—	jarubo	—	mon
monomondo	merendinyi	ngibungibuna	—	agarei
januga	jankabada (long-necked)	gangobada	—	dalmara
	komokon (red-mouthed)			
—	—	—	—	ubulo
mobol, koberle	deiyanga	walojolo, mangan	—	mon, manadi
kodar	rowo	yolba, tabalia	—	runga
—	—	—	—	aragin
konkodomolo	nyalnyal	janyin	—	yibara
momalbar	malbambar	malbamba	—	iripara
kojeipo	motju	motju	—	umugo
—	onawun	—	—	—
monkodobal	dobal	dobal	—	nabu
kojamararan	goyen	lebolo	—	ulibululi
monkorok, morok	rowana	borolo	—	makoi, magaj

English	Rittarungo Inland Tribe.	Rembarunga Inland Tribe.	Ngandi Inland Tribe.
tree paperbark (Melaleuca leucodendron)	kaja	dolka	kodolko
,, sandalwood	boropandala	—	-
,, stringy bark	karaika	dambarujan, kodaika	kodaika
,, white gum	—	molongo	mawamba
trepang	—	—	—
true	wangangara-niuru-mangarabandoin	jengeiyu	nidungan niurumai
try	mandungara	—	—
turkey (bustard) (Eupodotis australis)	walpurungu	walpurungu	warupurungu
turn around	—	—	—
turtle, shell-	—	- -	—
,, green-		—	—
,, or tortoise egg	mapo (fresh water)	—	—
,, -shell	-	—	—
twilight	—	ngekedawadawa-kaiwara-gunung	dawadawakumuruntuni
two	—		—
Uncle (father's brother, vide also father)	kaikainja	—	—
Vomit	lorujayuru	narakula	ngawerudong
vulva	—	deil	magen
Wake up	yor-yorngara	ngangera	ngangeitong
walk	wanewaneni	nararonguron gura, nginyonguron gura	nurudurudong nugurungudon
wallaby, river (Macropus agilis)	ngaruko	borongon	angaruko
,, rock	rangaruko	manderang	kandawul
wash	—	narangoramittina	nungoruding
water	kapo	jula, tyula	kojaru
waterhole	yuarm	yorom	koyorom
waves	-	—	.
weak	—	ngekedalana-walurwalur	nawarijaktin
wear	-	naramanintiana	ngarotan
west	nganewala	yukarin	nganeitj
what?	nakana?	mayana?	antjamere?
whiskers	jawanda	jawanda	kojawanda
whistle		naralotja	nuwerudong
white ant (termite)	morokolo	wanara	awanarayu, murukulu
,, man	monanga	monanga	—
wife (my)	dei-ngarako	nabadadingi	nadingi
wild "banana"	jolokon	murutin	murudin
,, honey	koko	tarda	ngekong
,, "potato"	jolokon	jolokon	kumurudin
wind	jamoi	ngoyoruk	mangondo
woman	nadinwai	tinkapul	wadea
wood, dry	tarupa	—	kotanda
,, green or wet	-	—	kojeli
wrong	merekongo ngoreia	malkjang	ngakodi
wurley (hut)	torokolya	—	goambi
Yam (Dioscorea sativa)	janma	jalma	majalma
yamstick	bachu	batji	kojaka
yellow ochre	kelewelja	kamanuko	makelwere
yes	bele	ao	yo-o, yowo
young man	—	koromol	bandari
,, woman	nading	baradeng ngalangalakun	mawarea
you	nimuka	nginyayu	nokan
your	nungumukayiki	nginjakan	nukangu

WEST COAST OF THE GULF OF CARPENTARIA.

Ngalakan Inland Tribe	Allawa Inland Tribe	Mara Gulf Tribe.	Wandaran Gulf Tribe.	Nungubuyu Gulf Tribe.
konkokot	weremal	korolowol	—	liwa
—	domboyombo	domboyombo	—	domborombo
kodanbar	dongonbiri	bambuja	—	loun, umu
konkongolongo	ngalanga	mawar	—	wilin
—	—	rokaroka	—	taripan
nowarukoru jopono	ngaiyulnanjin	nijundara		nubindi
—	—	—	—	barawin
beinuk	janberena	jamberina		alborong
—	—	—	—	bauligilingi
—	—	karuku	—	ngalua
—	—	jariwangani	—	walaligi
—	—	—	anigalao	ningala, kukaluk
—	—	karobi	—	—
kunmukpulungam	melmeldawul		—	minnu
meiappan	—	uruja	—	ulawa
—	bibibi	—		—
nguwera	wengene	wengajuli	—	barungina
mukene	—	—		rig
—	dunaiman	—	—	banualaka
nginyaraburabuna, ingurungura	balbalbiwinya, juruga	ngaijura, walendu	—	nganjari, baiyari
nadukodaitpal	jibileri	ngarukolamba billabong wallaby	angarukolamba	naragu
ngaruka	wangogo	wombarata	malegaru	andawul
nungorubittina	kolakanyingata	kolalajujulana	—	banwuyaralin
gue	ngoyena	ngogo	—	koko
koyorom	ngajal	ngajal	—	lawali
—	laban	laban	—	madoa
buru-boreokmin	jangaljangal	ngekedalana-walurwalur	nawerichu	lulgari, ninik
numaningdangana	—		—	bayabina
igerin	lorongadi	walakalir		alkalila
yanabaku?	nganjeni?	nginjane?	wongana?	yangi?
kojowanda	yawulungbulunga	jawanda	—	tarak
nginyuerua	werenamban	wirama	—	namayajungnung
nokomurukulu	morolo	morolo	ramimbi	murubu
—	—	monanga	—	monanga
bolobolongene	angereangaba	—	—	narakulku
kumurutin	ngoredin	ngorodin	—	—
mud(r)ad(r)a	wodo	ngolowaru	—	lako
monkajaladi	maningi	majaladi	—	jaladi
mongondo	bainga	walulu	—	otangui
wuruwurunga	wadea	ngerea	—	minmanung
konkolat	—	—	—	rangakudardak
kojeli	—	—	—	rangakalarli
kaboreok kagangan	danyaki wenitjinoka	—	weritju	mulwubara
kobaram	jolban	wambi	—	omor
muyawok	jalma	jalma	aulburu	loumok
monkojaka, ngujaka	makai	bijabija	maiyanga	lolmak, anung
mugelewere	daomai	kriayara, kilweru	—	otalak
wo-o, wowo	yo	yo, yoai	yoai	yo
bandari	—	walemal	—	ulmerinyung
jokomaringolakal	walema	walema	—	mugalangi
nginja	nangana	neia	—	nungawa
nginjanigin	ngambanya	neia	—	nukaui

ADELAIDE UNIVERSITY FIELD ANTHROPOLOGY: CENTRAL AUSTRALIA.

No. 5—DENTAL NOTES.

By T. D. Campbell, D.D.Sc.

[Read March 8, 1928.]

The following notes form a part of the data recorded at Macumba and Alice Springs during the University Expedition to these locations in January, 1927.

Paper No. 1, and subsequent contributions to this series,[1] contain various details concerning the individuals dealt with in this paper, and the key numbers used herein correspond with those previously scheduled.

Individuals examined.—All were full bloods. Total number examined in detail was 52. Of these 42 were males and 10 females. An approximate age grouping would show: 2 children, 5 young adults, 21 adults, and 24 mature and aged.

Arch form and position of teeth.—In almost every individual whose dentures were more or less complete, one found the customary capacious regular dental arches of the aboriginal. The few exceptions were noted thus: No. 8, slight crowding of the lower incisors; No. 32, crowding of the lower incisors, with impaction of the inferior third molars, the anterior cusps of these teeth being locked under the distal convexity of the second molars; No. 48, complete lingual displacement of the second lower left bicuspid; No. 52, retention of the upper deciduous canines, with the permanent canines in marked labial position; No. 62 had a very high dome to the palate.

Removal of teeth.—Out of 40 adult males examined in detail dentally, 7 showed removal of an upper incisor tooth. In Nos. 27, 46, 49 and 55, the right central; while Nos. 32, 34 and 40 showed the left central missing. In four cases the right, in three the left side tooth. In the case of No. 34 it was ascertained that the removal had taken place when he reached adult age.

Attrition.—The condition and wear of the teeth was recorded according to Broca's classification. It will be seen from the following table that 17 cases showed Stage I.; 12 cases Stage II.; 18 cases Stage III.; and 5 cases Stage IV.

Occurrence of dental caries.—The table given below shows the key number of the individual, sex, age, number of teeth present, number of teeth carious, and stage of occlusal attrition.

From the data obtained the following points may be derived:—

Total number of individuals examined	52
Total number of individuals with caries	35

Percentage of individuals with caries, 67·3.

Total number of teeth examined	1,558
Total number of teeth carious	113

Percentage of teeth carious, 7·2.

Number of deciduous teeth examined	34
Number of deciduous teeth carious	3

Percentage of deciduous teeth carious, 8·8.

(1) Trans. Roy. Soc. S. Austr., vol. li. (1927). Paper No. 1 contains "Introduction, Descriptive and Anthropometric Observations"; No. 2, "Physiological Notes"; No. 3, "Blood Grouping."

Age group.		No. of persons.	No. with caries.	Percentage.
Up to 12	.. ..	2	2	100
12 to 20	.. ..	5	—	—
21 to 45	.. ..	21	14	66
Over 45 and aged	..	24	19	79

In a previous paper [2] in which the present writer collaborated, among other data a summary was given of published records dealing with the occurrence of dental caries in the Australian native. Therein the following figures were given:—

From Ooldea region:

Percentage of individuals with carious teeth 60

Percentage of carious teeth .. .. 17·2

Summarized figures for Australian natives generally:

Incidence of dental caries in teeth of natives under natural conditions .. .. 2·1%

Incidence in teeth of natives living on semi- or wholly-civilized diet .. .. 17·5%

In will be seen that, compared with the figures recorded at Ooldea, the present group of Central Australian natives shows almost a similar incidence of persons with carious teeth, but the actual incidence of carious teeth is much lower. The percentage of carious teeth for the present group (7·2) is higher than the figures given (2·1) as indicating the occurrence under natural conditions. This is to be expected, as many of these natives have had access, no doubt for a long time, to a certain amount of modern foodstuffs. However, such pernicious dietetic habits as they may be inclined to adopt are tempered appreciably by the necessity of having to fend for themselves in the more "outback" regions; and the diet such conditions provide would certainly be rough and not elaborately prepared.

Certain investigators endeavour to postulate a close relation between the vitamin content of foods and the occurrence of dental caries. It would not, however, be easy to attempt any definite statement on the vitamin values of the aboriginal's natural diet. He seemed capable of devouring anything which was possibly edible; but preferably and actually his diet consisted largely of flesh food. It may be assumed, however, that such food preparations as were adopted would be unlikely to destroy the vitamin value it possessed. We do know for certain that his food was rudely prepared and of a coarse, tough nature, thus stimulating a vigorous mastication and active salivary secretion; and it seems probable that a definite relation exists between these physical characteristics of his dietary and the comparatively low percentage in the incidence of carious teeth.

Record is herein made of two children under twelve years showing carious teeth. It is interesting to note that this is the first occasion among the many skulls and living subjects of Australian native children examined that the present writer has observed a carious deciduous tooth, a fact very significant when the dental condition of present-day white children is considered.

Pathological conditions.—Besides recording the occurrence of caries, some brief notes were made on such other pathological conditions as presented; but these were very rare. No. 21 had an alveolar abscess associated with the lower right first bicuspid, and also showed several teeth with obvious examples of

(2) Australian Journal of Dentistry, December, 1926, p. 371, "Dental Observations recorded at Ooldea."

arrested caries. No. 49 had an alveolar abscess associated with the upper left lateral incisor.

Gum tissues.—On the whole, the gum tissues of the native were appreciably firm and healthy looking, especially when one considered that many of them had access to some refined foodstuffs.

Summary.—It may be stated that in general these natives showed well-formed dental arches with strong, appreciably worn teeth. The occurrence of dental caries was somewhat higher than has been shown to exist among natives in their natural environment; but, on the other hand, very considerably lower than the prevalence of this condition among civilized white peoples. Their gums were generally firm and healthy, and very few dental pathological conditions were present other than caries. In cases of removal of one of the front teeth, it was one or other of the upper central incisors; this being usually the case among the Central tribes.

The dental condition of these natives, generally, again, supports the contention that the less refined the foodstuffs used, the less will be the occurrence of dental abnormalities and pathological conditions.

Key No.	No. of teeth.	No. of carious teeth.	Stage of attrition.	Key No.	No. of teeth.	No. of carious teeth.	Stage of attrition.
1	31	3	II.	38	32	—	I.
2	32	1	II.	39	31	2	IV.
5	17	7	III.	40	27	—	I.
6	29	2	III.	41	30	2	III.
8	12d. 12p.	1d.	I.	42	28	—	I.
9	20d.	2d.	I.	43	31	—	I.
11	31	2	I.	44	32	—	II.
12	32	8	III.	45	30	—	I.
16	30	1	I.	46	31	—	III.
17	30	5	II.	47	32	3	III.
18	30	3	II.	48	32	1	I.
21	31	3	III.	49	31	—	III.
22	28	—	I.	50	31	5	IV.
24	32	2	I.	51	30	7	IV.
25	26	5	III.	52	32p. 2d.	2	I.
26	30	1	II.	53	23	—	IV.
27	31	—	III.	55	31	—	I.
28	32	—	I.	56	30	1	II.
29	30	10	II.	57	32	3	III.
31	30	2	III.	58	32	2	II.
32	31	—	II.	59	32	—	III.
33	32	2	I.	60	26	7	III.
34	30	—	I.	61	32	1	III.
35	32	5	III.	62	30	6	III.
36	32	—	II.	63	32	1	IV.
37	32	2	II.	64	31	3	III.

AUSTRALIAN CUMACEA.

By Herbert M. Hale, Curator, South Australian Museum.

(Contribution from the South Australian Museum.)

[Read March 8, 1928.]

This paper deals, in the main, with Cumaceans taken by Sir Joseph Verco, Dr. Robt. Pulleine, the late Mr. Edgar R. Waite, and the writer; these are now in the South Australian Museum collection. Few species of the order have been recorded from Australia. G. O. Sars [1] described three members of the genus *Cyclaspis* taken by the "Challenger," and C. Zimmer [2] named thirteen species secured by the Hamburg Expedition to South-western Australia, and by Dr. Mjoberg's Swedish Expedition. With the few additions now made only twenty-five identified species may be listed from our waters; all but one of the new species were dredged off the coast of South Australia.

In his invaluable review of the Cumacea of the world Stebbing [3] recognized twenty-six families, no fewer than sixteen of which were erected by him; thirteen of the last include only one genus, and the same number less than half a dozen species. Stebbing [4] himself admits the weakness of some of the families, and I agree with Calman [5] that the establishing of these new divisions is undesirable for the present. There is no doubt that a great number of new species must be still undescribed, and as these become known there is a probability that, under Stebbing's artificial arrangement, there will be a tendency to further isolate closely linked genera in different families. If, on the other hand, newly discovered forms, with their attendant complications, are distributed amongst the already erected families, there is indication that it will be exceedingly difficult to retain worthy and distinctive differences between certain of the last-named.

The species at present known from Australian seas are as follow:—

Family BODOTRIIDAE.

Cyclaspis australis, Sars. Port Philip, Victoria.
C. pusilla, Sars. Flinders Passage, North Australia.
C. exsculpta, Sars. Flinders Passage, North Australia.
C. supersculpta, Zimmer. Off Cape Jaubert, North-western Australia.
C. candida, Zimmer. Off Cape Jaubert, North-western Australia.
C. mjobergi, Zimmer. Off Cape Jaubert, North-western Australia.
C. bovis, n. sp. South Australia.
C. tribulis, n. sp. South Australia.
C. spilotes, n. sp. Gulf St. Vincent, South Australia.
Eucoma agrion, Zimmer. Fremantle, Western Australia.
Vaunthomsonia (?) *australiae*, Zimmer. Off Cape Jaubert, North-western Australia.
Leptocuma pulleini, n. sp. Encounter Bay, South Australia.
Sympodomma africanum, Stebbing. Gulf St. Vincent, South Australia.

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(1) Sars, Rep. Voy. "Challenger," xix., 1887, pp. 12-20, pl. i.

(2) Zimmer, Fauna Südwest Austr., v., 1914, pp. 175-195, figs. 1-18, and Kungl. Svenska Vet.-Akad. Hand., lxi., 1921, pp. 4-13, figs. 1-16.

(3) Stebbing, Das Tierreich. Lief., xxxix., 1913.

(4) Stebbing, Ann. S. Afr. Mus., x., 1912, p. 134.

(5) Calman, Proc. U.S. Nat. Mus., xli., 1912, p. 608.

Family NANNASTACIDAE.

Cumella hispida, Calman. Sharks Bay and off Fremantle, Western Australia.
C. michaelseni, Zimmer. Sharks Bay, Western Australia.
C. gibba, Zimmer. Sharks Bay, Western Australia.
C. cyclaspoides, Zimmer. Sharks Bay, Western Australia.
Nannastacus nasutus, Zimmer. Sharks Bay and off Albany, Western Australia.
N. nasutus var. *camelus*, Zimmer. Off Albany, Western Australia.

Family DIASTYLIDAE.

Dic lasiodactylum, Zimmer. Off Geraldton, Western Australia.
Gynodiastylis hartmeyeri, Zimmer. Sharks Bay, Western Australia.
G. similis, Zimmer. Sharks Bay, Western Australia.
G. truncatifrons, n. sp. Gulf St. Vincent, South Australia.
G. turgidus, n. sp. Robe, South Australia. ..
Anchicolurus waitei, n. sp. Robe, South Australia.
Leptostylis vercoi, n. sp. Geographe Bay, Western Australia.

Family BODOTRIIDAE.

CYCLASPIS, Sars.

The listed Australian species may be separated by the character of the carapace alone, but it should be noted that both sexes are not known in all of them.

a. Carapace sculptured.
  b. Carapace with two transverse carinae on back; with very strong ridges and projections, so that the dorsal outline (as seen from the side) is elevated and uneven.
    c. Carapace with second dorsal carina elevated to form a pair of large spines behind middle of length; ridges not enclosing a quadrangular or subtriangular depressed area on sides .. *bovis*
    cc. Carapace with second dorsal carina elevated but not forming acute, thorn-like projections; ridges enclosing a quadrangular or subtriangular depressed area on sides.
      d. Carapace with a distinct median dorsal carina connecting the two large transverse ridges.
        e. Sides of carapace with two ridges running forward from anterior crest; dorsum with a median posterior projection and a smaller dorso-lateral projection on each side .. .. *exsculpta*
        ee. Sides of carapace without ridges running forward from anterior crest; dorsum with a median posterior projection but no dorso-lateral elevations .. .. .. *tribulis*
      dd. Carapace without distinct median carina connecting the large transverse ridges .. .. *supersculpta*
  bb. Carapace with ridges moderate or feeble, the dorsal outline in side view almost evenly curved.
    f. Sides of carapace with more than one ridge.
      g. Carapace gibbous posteriorly, its greatest depth two-thirds the length .. .. *australis*
      gg. Carapace not gibbous posteriorly, its greatest depth one-half the length .. .. *candida*
    ff. Sides of carapace with one low and very oblique ridge .. *spilotes*
aa. Carapace smooth.
  h. Carapace with a median dorsal keel .. .. *pusilla*
  hh. Carapace without median dorsal keel .. .. *mjobergi*

Cyclaspis bovis, n. sp.

Immature female. Integument hard and firm, with finely imbricate surface. Carapace deep, more than one-fourth the total length, and strongly sculptured. Pseudorostral lobes just reaching to apex of narrow ocular lobe, each truncate

and slightly oblique in front. Antennal notch moderately wide and antennal tooth subacute. Behind the eyelobe is a short and abruptly elevated transverse carina, almost in line with a ridge which crosses the base of each lateral plate and forms the dorsal edge of a deep, flattened projection on each side. Viewed from the front the lateral edges of each of these projections are tridentate, the upper tooth the most prominent, the others small. A little behind middle of length of carapace is a pair of large dorsal spines, each leaning slightly outwards and forwards; a deep, median dorsal carina runs from the middle of the anterior transverse ridge to the base of these teeth, and behind them is a small median dorsal tooth or tubercle. On each side (in addition to the large anterior projection) are two low elevations on the posterior portion; the upper of these forms the termination

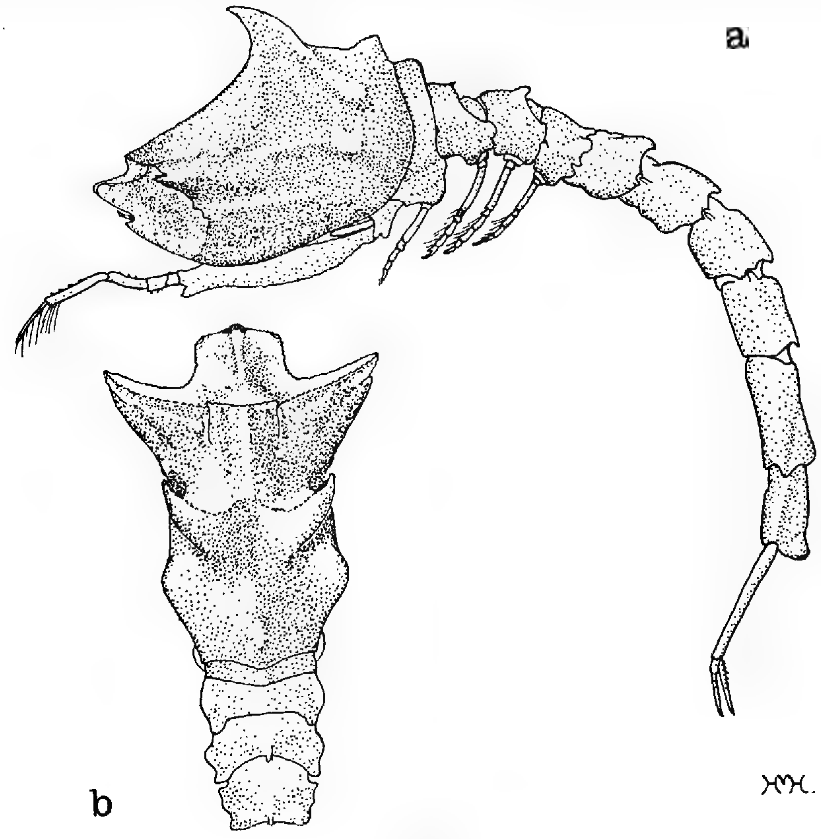


Fig. 1.
Cyclaspis bovis, type female. a, Lateral view; b, dorsal view of cephalothorax (x 8).

of a rather obsolete ridge running up the back of each dorsal tooth; from the lower elevation radiate two faint ridges, one of which forms an angle with a carina which leads up to the antero-lateral edge of each dorsal tooth. A ridge runs back from the second tooth of the great anterior projection. Second pedigerous somite fixed to carapace, large, with side-plates expanded, and with a short, elevated dorsal carina. Third leg-bearing somite tumid dorso-laterally; fourth and fifth each with a median posterior tooth and a pair of dorso-lateral projections. First four abdominal segments somewhat square in section, each with a pair of dorso-lateral carinae, the hinder ends of which are slightly concave; last two somites with a median ridge and an oblique carina on each side; second

to fourth with small lateral articular processes. Basis of third maxillipeds increasing in width distally, with a serrated ridge on outer face, and produced apically into a lobe which reaches to level of apex of ischium; ischium longer than carpus and shorter than merus, which is produced distally into a lobe which reaches nearly to apex of carpus; dactylus little longer than propodus and subequal in length to carpus. First legs about one and one-fourth times as long as the carapace; basis furnished with a serrated ridge on inner face, narrowed distally and with a subacute apical process, and about as long as the remaining joints together; ischium two-thirds as long as merus, which is three-fourths as long as carpus and about two-thirds as long as propodus. Ischium distinct in all other legs, one-half or less than half length of merus; propodus as long as dactylus in third to fifth legs, barely half as long in second. Peduncle of uropods slender, finely serrated on inner edge, as long as fifth pleon somite and more than twice as long as rami, which are subequal in length; proximal parts of edges of single-jointed endopod serrated, and basal joint of exopod one-third as long as second joint. Colour pure white.

Length, 18 mm.

Loc.—South Australia (Sir J. Verco). Type, female, in South Australian Museum, Reg. No. C. 1772.

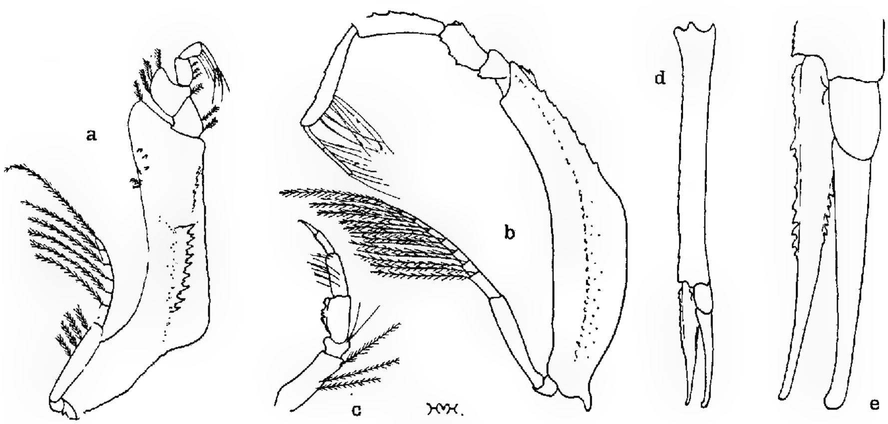


Fig. 2.

Cyclaspis bovis, paratype female. a, Third maxilliped (x 14); b, first leg (x 14); c, fifth leg (x 14); d, uropod (x 14), e, rami of uropod (x 36).

A second female 19·5 mm. in length differs in having the pair of dorsal spines not divergent one from the other; as shown by the illustrations, these spines are much more prominent than the lateral projections when the animal is seen from the side, but the condition is reversed when it is viewed from above.

This species is allied to *C. persculpta*, Calman, *C. exsculpta*, Sars, and *C. supersculpta*, Zimmer, etc.

Cyclaspis tribulis, n. sp.

Immature female. Integument hard. Carapace about one-fourth total length, with two strong transverse ridges; surface somewhat reticulate owing to numerous pits, the edges of some of which form acute tubercular projections, especially near edges of ridges. Pseudorostral lobes not quite reaching to apex of narrow overlying ocular lobe, which bears a few silvery apical lenses. Antennal notch distinct, and antennal tooth subacute. At base of eyelobe is a short elevated carina, or flat compound tubercle; immediately behind this is the first large ridge,

crossing the dorsum transversely and running obliquely downwards and backwards on the side to meet the second transverse carina near the infero-posterior angle of the carapace. Anterior ridge deep, and cut into five flattened, rounded teeth or lobes, one on the dorsum and two on each side; viewed from the front this carina resembles a rosette enfolding the dorsal and lateral parts of the animal. Second carina strongly elevated dorso-laterally, forming a pair of rather flattened lobes; the two transverse ridges are connected by an obtuse, median longitudinal carina, and by a pair of far less distinct dorso-lateral crests. Posterior end of carapace with a median dorsal conical elevation. Fourth and fifth pedigerous segments each with a median dorsal ridge and rather feeble dorso-lateral elevations. Pleon segments each with a median dorsal carina and infero-lateral and dorso lateral carinae; last-named most distinct on anterior segments and almost

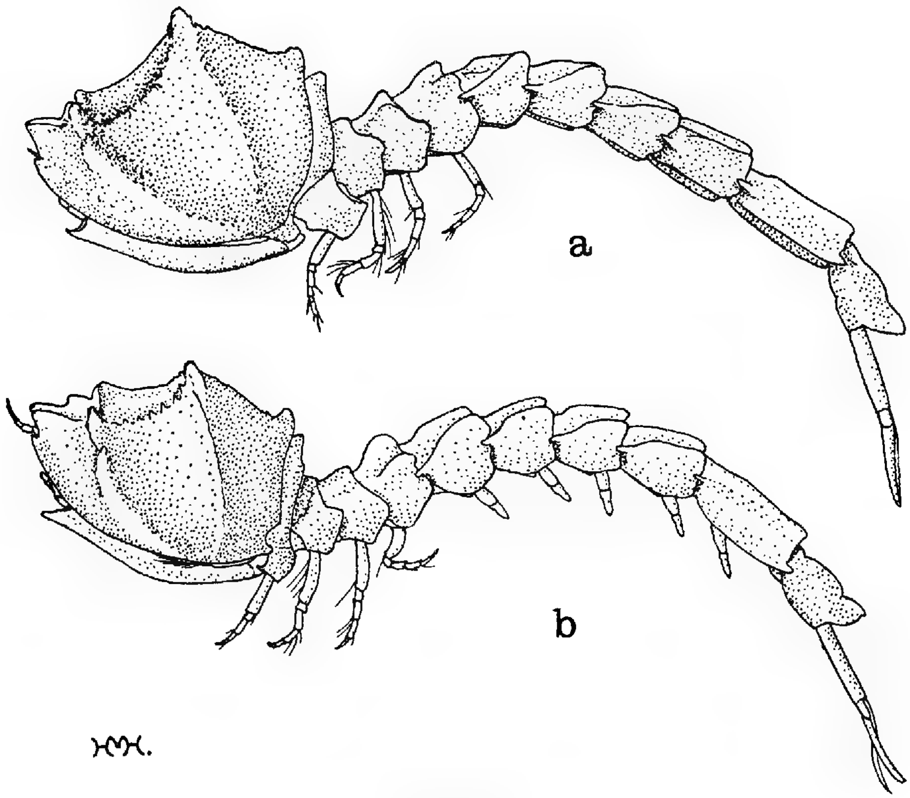


Fig. 3.
Cyclaspis tribulis. a, Type female; b, paratype male (x 11½).

obsolete on last two; first five somites with lateral articular processes. Basis of third maxillipeds slightly widened distally and produced beyond level of apex of ischium, which is shorter than carpus and about as long as propodus; merus produced to slightly beyond apex of carpus; both carpus and propodus are widest distally. Basis of first legs narrowed on distal half and with a small apical process. Ischium of second legs one-third as long as merus, which is longer than carpus. Merus much longer than ischium, and shorter than carpus in third to fifth legs. Uropods nearly as long as fifth and sixth pleon segments together and with the peduncle about as long as the subequal rami. Colour pure white.

Length, 11·5 mm.

Immature male. The sculpturing of the carapace is a little less marked than in the female, but in the main differs very little.

Length, 12 mm.

Loc.—South Australia (Sir J. Verco). Type, female, in South Australian Museum, Reg. No. C. 1770.

Only two slightly mutilated specimens are available; as in the type of *C. exsculpta*, Sars, both examples have the terminal joints of the first legs missing. They are so exceedingly close to *C. supersculpta*, Zimmer,(6) that it is with much hesitation that I propose a name for them. They apparently differ from Zimmer's type immature female in having more strongly developed projections from the first large transverse ridge, and a short elevation on the dorsum in front of this ridge in having a median dorsal carina connecting the transverse ridges and only one projection at the hinder end of the carapace, and in the proportions of the uropods. Zimmer states that the peduncle of the last-named is only half

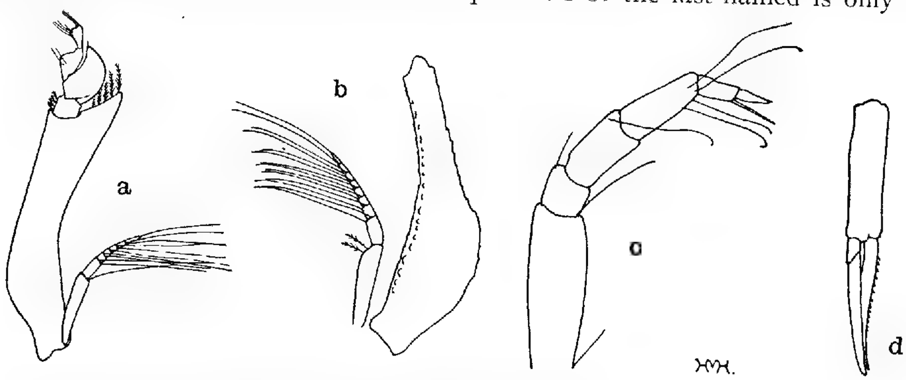


Fig. 4.

Cyclaspis tribulis, type female. a, Third maxilliped (x 16); b, basis of first leg (x 16); c, fourth leg (x 42); d, uropod (x 16).

as long as the rami in *C. supersculpta;* it is shown thus in his fig. 11, but in his fig. 8 appears as long as the rami.

It is evident that examination of more material of Australian species of the *exsculpta* group is most desirable.

Cyclaspis spilotes, n. sp.

Male. Form slender and integument moderately indurated. Carapace rather small, only about one-fifth total length, with a well-developed, sharp, median dorsal carina for whole length, and with a fine oblique ridge on each side, curving from the median carina forwards and downwards to the antero-inferior margin and fading into the margin near antennal tooth; surface very finely imbricate and with numerous shallow pits. Pseudorostral lobes slightly obliquely truncate and not extending beyond ocular lobe, which is moderately wide and bears large lenses. Antennal notch wide and antennal tooth subacute. Fourth and fifth pedigerous segments with low dorso-lateral carinae. Each pleon segment with a low median carina, and infero-lateral and dorsal-lateral carinae; the last are oblique and ill-defined on the sixth somite; first five pleon segments with lateral articular processes. Second and third joints of first antennae subequal in length, each barely more than one-third the length of first segment; flagellum short and two-jointed. First legs only about one-eighth longer than carapace, the carpus not reaching to antennal notch; basis much narrowed

(6) Zimmer, Kungl. Sv. Vet.-Akad. Hand., lxi., No. 7, 1921, p. 7, figs. 8-11.

distally with an acute apical process and slightly longer than the remaining joints together; ischium much shorter than merus, which is stouter and a little shorter than carpus; dactylus about as long as carpus and not much more than half as long as propodus. Basis of remaining legs long (as long as other joints together in third legs); ischium less than half as long as merus in all but fourth pair; merus longer than carpus in second legs, shorter than carpus in third to fifth. Uropods longer than last two pleon segments together; peduncle a little longer than exopod,

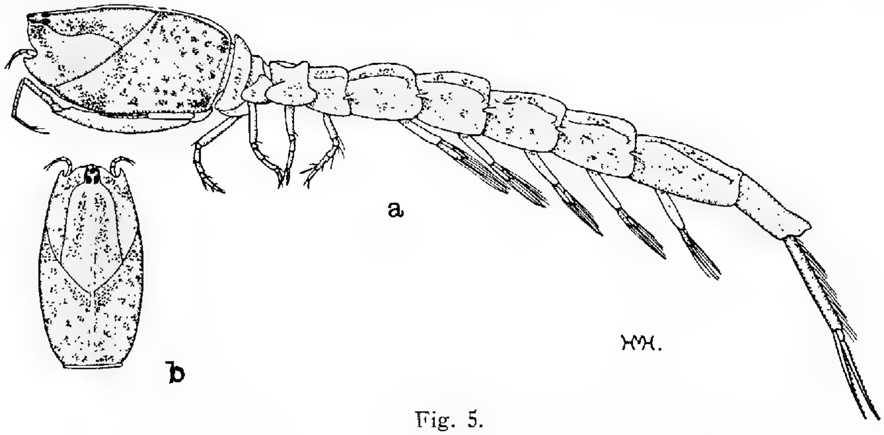


Fig. 5.

Cyclaspis spilotes, type male. a, Lateral view; b, dorsal view of carapace (x 10).

its inner margin fringed with rather long hairs; both rami lanceolate; exopod slightly longer than endopod and armed with a dozen spines on inner edge; inner edge of endopod finely serrate, furnished with about eleven spines and (near the base) with a few long hairs. Colour pale brown, with splashings and mottlings of dark brown.

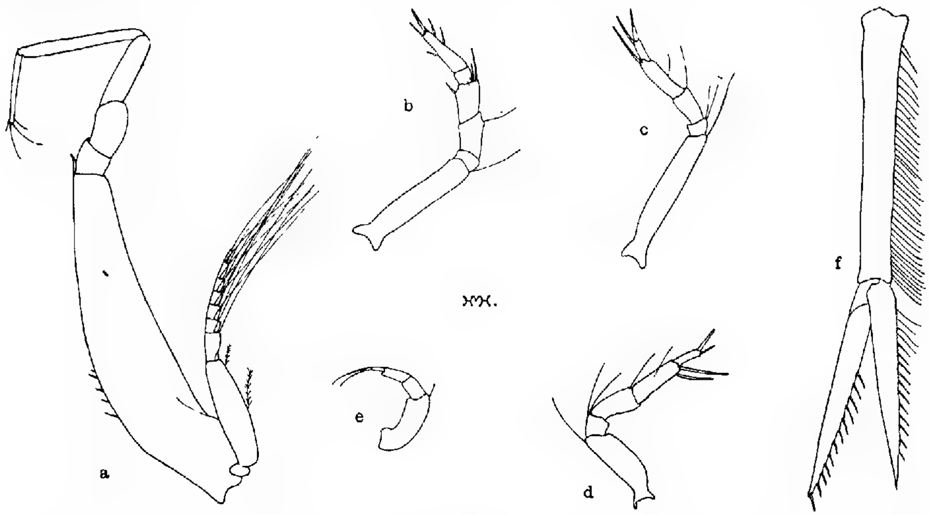


Fig. 6.

Cyclaspis spilotes, type male. a, First leg; b, second leg; c, third leg; d, fifth leg; e, first antenna; f, uropod (x 29).

Length, 11 mm.

Loc.—South Australia: Gulf St. Vincent, five miles off Semaphore, 5 faths. (H. M. Hale). Type, male, in South Australian Museum, Reg. No. C. 1753.

Resembles *C. australis,* Sars, in some respects, but is readily separated by the shape of the carapace, which lacks the curved lateral prominence passing down to the rear, the different proportions and clothing of the uropods, the sculpture of the pleon, etc.; also, the second pedigerous segment is not firmly attached to the carapace. The single male described above was dredged on a white sand bottom.

LEPTOCUMA, Sars.

Leptocuma pulleini, n. sp.

Ovigerous female. Body subcylindrical, a little compressed, very slender, and tapering evenly and gradually from head to end of pleon. Carapace only about one-seventh the total length, its vertical height one-half its length; smooth excepting for a very low median dorsal carina (which has an impressed line down the

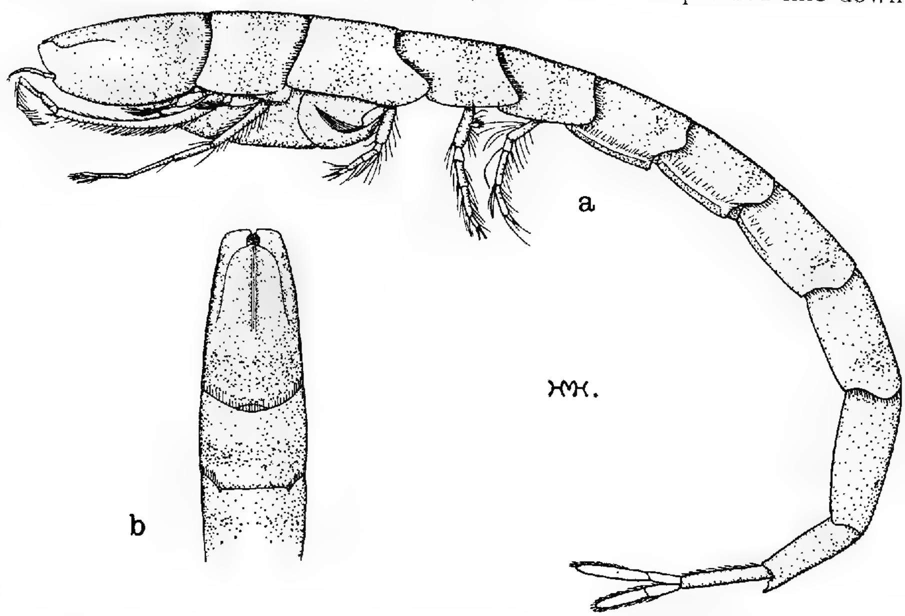


Fig. 7.
Leptocuma pulleini, type female. a, Lateral view; b, dorsal view of anterior part of thorax (x 7).

middle) on anterior half. Pseudorostral lobes short and obliquely truncate, produced in advance of the ocular lobe for a distance equal to half length of last-named, but not quite meeting in front. Ocular lobe semicircular and eye pigmented. Antennal notch moderately wide and antennal angle rounded. Second to fifth pedigerous segments subequal in dorsal length, but only a tiny dorsal portion of first somite exposed, and this only visible from above. Second somite with side plates expanded and overlapping first segment and base of carapace; pleural plates of third segment greatly expanded, overlapping second and fourth segments. First, second, and sixth pleon somites subequal in length, each shorter than third; fourth segment a little longer than third and slightly shorter than fifth; first two segments with low infero-lateral carinae, and third segment with indistinct infero-lateral ridges; pleon otherwise quite smooth. Margins of second to fifth pedigerous segments, and of first to fourth pleon segments, fringed with short adpressed bristles. First antennae with basal joint nearly as long as second and third together; second scarcely longer, but stouter, than third; flagellum four-jointed and accessory flagellum rudimentary, composed of a single joint. Palp

of first maxillipeds four-jointed, the first two joints broad and lamellate; the three terminal segments are furnished with numerous plumose setae. Second maxillipeds much more slender than first, with the terminal joints of the palp bristled; basis margined with plumose setae, and with two long feathered bristles at apex; ischium very short and merus slightly longer than propodus, which is only half as long as carpus. Third maxillipeds fringed with plumose setae, those on basis forming a dense fringe; ischium short, and merus and propodus subequal in length, each more than half as long as carpus. Basis of first legs reaching forwards nearly to antennal notch, nearly half as long again as remaining joints, very narrow, edged with plumose setae and bearing two inferior spines, one, at

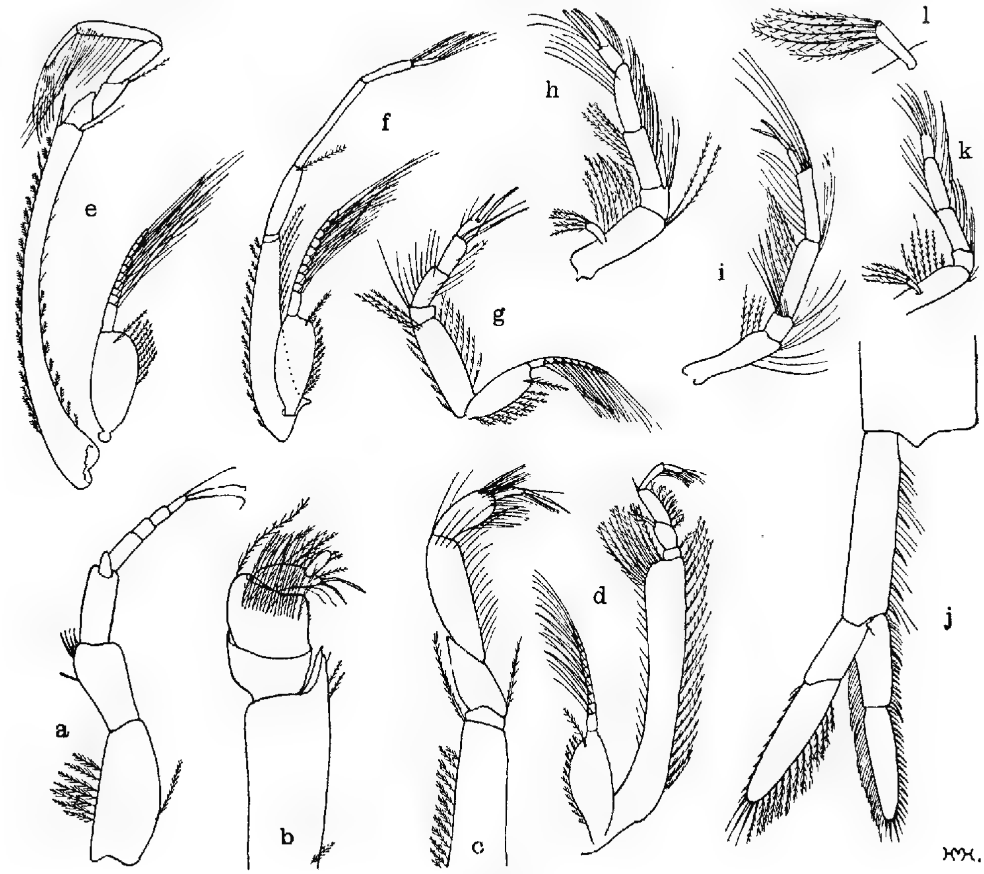


Fig. 8.

Leptocuma pulleini, type female. a, First antenna (x 40); b, first maxilliped (x 40); c, second maxilliped (x 40); d, third maxilliped (x 15); e, first leg (x 15); f, second leg (x 15); g, third leg (x 15); h, fourth leg (x 15); i, fifth leg (x 15); j, uropod (x 15). k, Fourth leg of paratype male (x 15); l, exopod of fourth leg of male (x 40).

the distal apex, being nearly as long as ischium; propodus longer than dactylus and a little shorter than merus and carpus together; the two terminal joints with numerous long setae. Second legs long and narrow, reaching as far forward as basis of first pair; basis tapering from base to apex and fully three-fourths as long as terminal joints together; ischium very short and carpus longer than merus or propodus. Third to fifth legs densely fringed with setae and plumose bristles; each with ischium short and merus and carpus subequal in length;

fourth and fifth pairs of about equal length, about one-third as long again as third legs. An exopod is well developed in the first three pairs of legs; in the fourth pair it is rudimentary and two-jointed, the second joint very minute, and in the fifth absent. Peduncle of uropods nearly as long as last pleon segment, with half a dozen spines and a fringe of setae on inner edge; endopod slightly longer than peduncle, with second joint one-fourth as long again as first, and with inner edge armed with slender spines and two stout spines, one at apex of proximal joint and one near middle of length of that joint; outer edge of endopod fringed with setae; exopod subequal in length to endopod, with distal joint three-fourths as long again as proximal; inner edge of second joint fringed with plumose setae, apex with plain bristles and outer margin with short, slender spines. Colour cream, with a faint bar of brown on each segment.

Length, 24 mm.

Immature male. Has all the general facies of the female, but the body is a little more slender. Exopods are well developed on the first three pairs of legs, but on the fourth pair only a rudimentary exopod, similar to that of the female, is apparent. Five pairs of pleopods each with exo- and endopod, are developed.

Length, 19 mm.

Loc.—South Australia: Encounter Bay (R. Pulleine). Type, female, in South Australian Museum, Reg. No. C. 1745.

In addition to the two examples described above two immature and two adult females, ranging from 17 to 24 mm. in length, were taken. The species is close to the genotype, *L. kinbergii*, Sars,(7) but differs in the even more slender form, in the proportions of the uropods, the presence of a slight dorsal carina on the carapace, etc. The first pedigerous segment is wholly concealed in some specimens.

From the examination of females alone one would certainly presume that *L. minor*, Calman,(8) and *L. pulleini*, are both congeneric with *L. kinbergii*. The male of Calman's species, however, has a well-developed exopod on the fourth legs and only three pairs of pleopods, whereas, as noted above, the male of the Australian species has only a rudimentary exopod on the fourth legs and five pairs of pleopods. Apparently the genotype is known only from females, so it is necessary, for the present at any rate, to refer the Australian form to *Leptocuma*.

Sympodomma, Stebbing.

Sympodomma africanum, Stebbing.

Sympodomma africanus, Stebb., Ann. South Afr. Mus., x., 1912, p. 138, pl. i.
Sympodomma africanum, Stebb., Das Tierreich., xxxix., 1913, p. 17, fig. 11.

Two young females from South Australia agree on the whole with Stebbing's descriptions and figures of a young male, but differ in the following characters, which are doubtless due to age and sex. The carapace is slightly deeper, and in dorsal view is rather more narrowed towards the front; the last of the three teeth into which the frontal part of the dorsal carina is cut has a smaller tooth on its posterior slope. Eye lenses are far less numerous, a pair of black lenses and one unpigmented lens being made out. The second to fifth pedigerous segments, as seen from above, are wider, and each has only one median carina, which is strongly elevated anteriorly on the second to fourth somites, less strongly in the fifth. The sculpture of the pleon somites is more marked; each segment has dorso-lateral, lateral, and infero-lateral carinae, as well as a distinct median dorsal carina; on the telsonic segment the lateral carinae are obsolete. The third maxillipeds have the merus less strongly produced distally, and the apex of the basis

(7) Sars, Kongl. Svenska Vet.-Akad. Hand., xi., No. 2, 1873, p. 24, pl. vi., figs. 29-33.
(8) Calman, Proc. U.S. Nat. Mus., xli., 1912, p. 616, figs. 14-20.

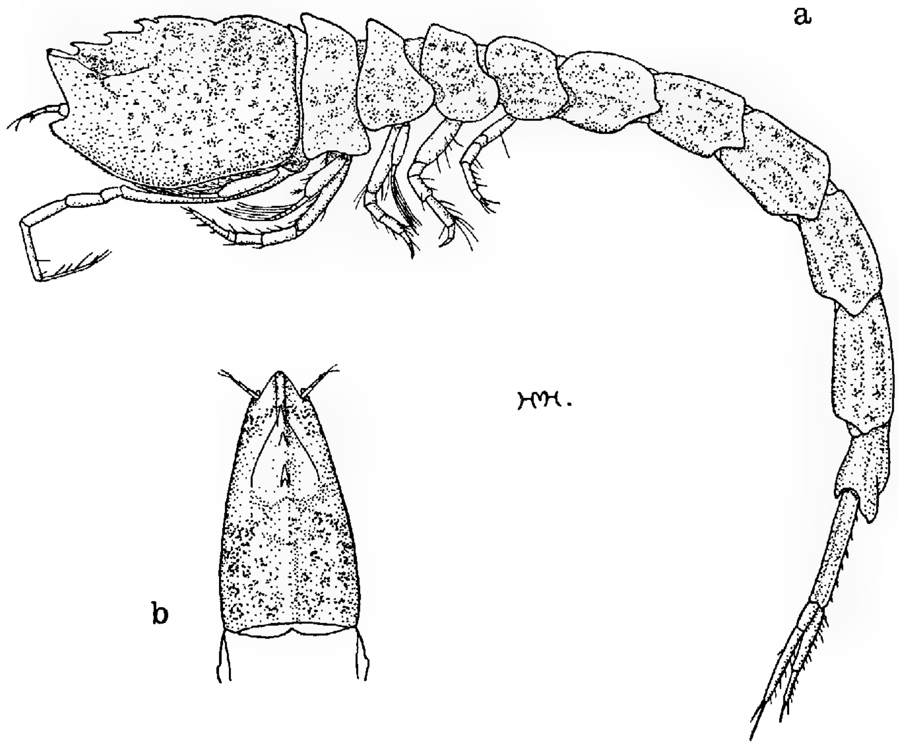


Fig. 9.
Sympodomma africanum, immature female. a, Lateral view; b, dorsal view of carapace (x 12).

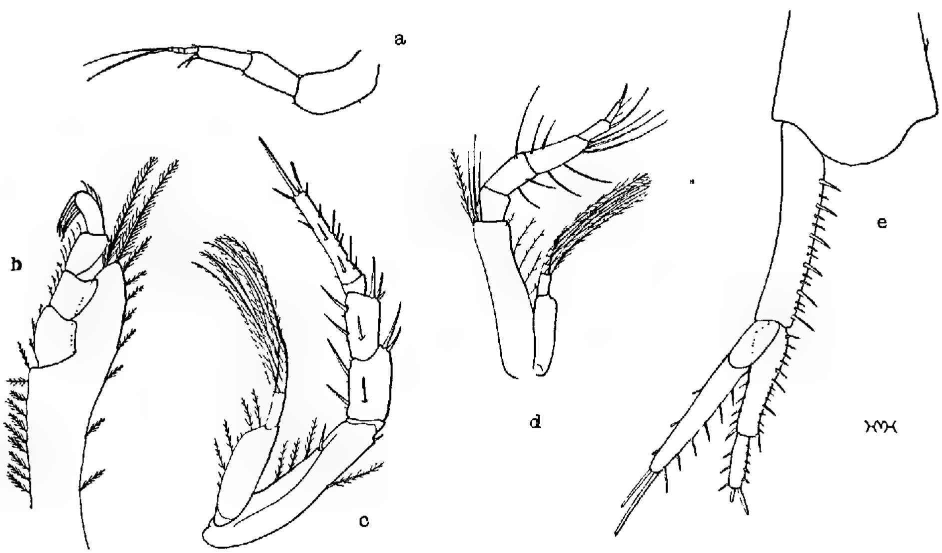


Fig. 10.
Sympodomma africanum, immature female. a, First antenna (x 33); b, terminal part of third maxilliped (x 33); c, second leg (x 25); d, third leg (x 25); e, telsonic segment and uropod (x 20).

much more produced, reaching well beyond the distal end of the merus. The legs are as shown by Stebbing; the peduncle of the uropods is carinate (so that in section it is triangular) and is scarcely longer than the exopod; the endopod is shorter than the exopod, with the first joint about twice as long as the second. It may be added that the integument is hard and the colour is light biscuit-brown, mottled and spotted with dark brown.

Length, 12·5 mm.

Loc.—South Australia: Gulf St. Vincent, off Outer Harbour, 6 fath. (H. M. Hale).

Hab.—South Africa and Southern Australia.

Family DIASTYLIDAE.

GYNODIASTYLIS, Calman.

Calman [9] described four species of the genus, Zimmer added two Western Australian forms, and two are recorded below; the members of the genus may be separated as follows:—

a. Uropods simple .. .. *laevis*
aa. Uropods with more than one joint.
  b. Uropods three-jointed .. .. *hartmeyeri*
  bb. Uropods two-jointed.
    c. Carapace with at least five longitudinal ridges on each side.
      d. First joint of endopod of uropods longer than second. Carapace with five or six longitudinal ridges on each side *carinatus*
      dd. First joint of endopod of uropods not longer than second. Carapace with numerous longitudinal ridges on each side.
        e. Exopod of uropods not or little shorter than endopod. First legs rather elongate .. .. *costatus*
        ee. Exopod of uropods only three-fifths as long as endopod. First legs short and stout .. .. *turgidus*
    cc. Carapace smooth, or with only one longitudinal ridge on each side.
      f. Uropods with first joint of endopod shorter than second .. *bicristatus*
      ff. Uropods with first joint of endopod longer than second.
        g. Carapace with a curved ridge on each side. Endopod of uropods with first joint one-fourth as long again as second .. .. *truncatifrons*
        gg. Carapace without ridges. Endopod of uropods with first joint twice as long as second .. .. *similis*

Gynodiastylis turgidus, n. sp.

Ovigerous female. Carapace more than one-third total length, plump, with its vertical height about two-thirds greatest length; dorsal margin considerably curved; sides with numerous longitudinal ridges, the uppermost dorso-lateral ridge crenulate, longer and more prominent than the others; anterior portion of dorsal margin and inferior margin crenulate. Pseudorostral lobes acutely pointed, projecting in front of ocular lobe for a distance equal to two-ninths of length of carapace; margins crenulate. Antennal notch wide and antennal tooth acute. The five free pedigerous segments are together shorter than carapace; pleural parts of second somite produced in front, those of the third in front and behind. Pleon six-sevenths of total length of thorax; the four anterior somites subequal in length, fifth longer and sixth shorter; telson scarcely more than half as long as sixth segment. First legs stout and not extending much beyond apices of pseudorostral lobes, with merus reaching to level of antennal angle; basis as long as the three following joints together, merus much longer than ischium and carpus twice as long as merus. Basis of second legs stout and about as long as

(9) Calman, Trans. Zool. Soc., xviii., 1911, pp. 367-374, pl. xxxv., figs. 6-39, and pl. xxxvi., figs. 1-22.

the other joints together. Remaining legs short and stout, with ischium short, merus approximately three-fourths as long as basis, and the three terminal joints very short. Third legs articulated at posterior end of their thoracic somite, leaving a wide gap between second and third legs; fifth legs articulated dorso-laterally. Peduncle of uropods twice as long as telson, and as long as fifth pleon segment; exopod only three-fifths as long as endopod, with one long and one

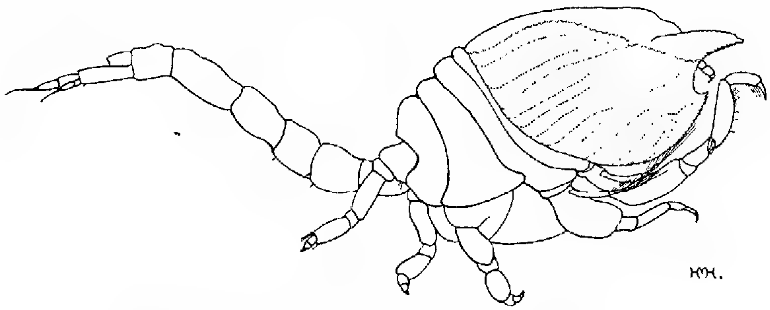


Fig. 11.
Gynodiastylis turgidus, type female (x 36).

short, curved stout seta at apex; endopod two-thirds as long as peduncle, two-jointed, with the first segment slightly shorter than distal and with two stout apical setae, one long and one very short.

Length, 2·7 mm.

Loc.—South Australia: Robe, 3 fath. (Edgar R. Waite). Type, female, in South Australian Museum, Reg. No. C. 1750.

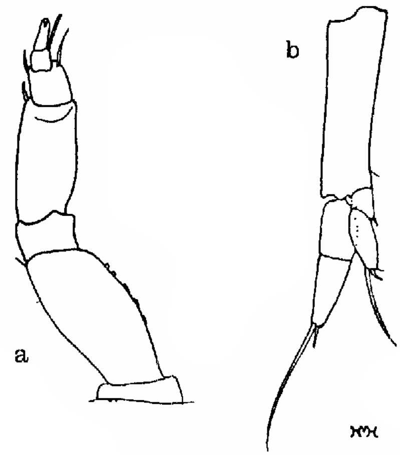


Fig. 12.
Gynodiastylis turgidus, type female. a, Fifth leg; b, uropod (x 120).

The single available female, which is mounted in balsam, has about half a dozen relatively very large eggs in the brood pouch. As in *G. costatus*, Calman, the carapace is marked with numerous ridges, but the form is stouter and the legs wider than in that species; also the first legs are considerably shorter, with the joints of different proportions, and the uropods are very different.

Gynodiastylis truncatifrons, n. sp.

Female with young. Carapace one-third of total length, subcylindrical, its vertical height rather more than half dorsal length; dorsal margin nearly straight;

each side with a low ridge, curving backwards and upwards from antennal notch, and back with a pair of shallow longitudinal grooves on posterior half; carapace otherwise smooth excepting for a few shallow pits. Pseudorostral lobes acutely pointed, deep, meeting in front of ocular lobe for a distance equal to nearly one-third of rest of carapace, oblique and slightly concave in front and fringed with fine short hairs. Antennal notch defined by a rounded, slightly projecting angle. Eyelobe about twice as wide as long, with three corneal lenses. The five free pedigerous segments together three-fourths as long as carapace, each in dorsal view as wide as the last-named. Pleural plates of second free somite produced in front, those of third slightly in front and greatly posteriorly. Pleon only about two-thirds the length of thorax; third and fourth segments with three tiny spines on each side; fifth somite not much longer than sixth, which is depressed. Telson as long as, but much narrower than, sixth segment, depressed, rounded

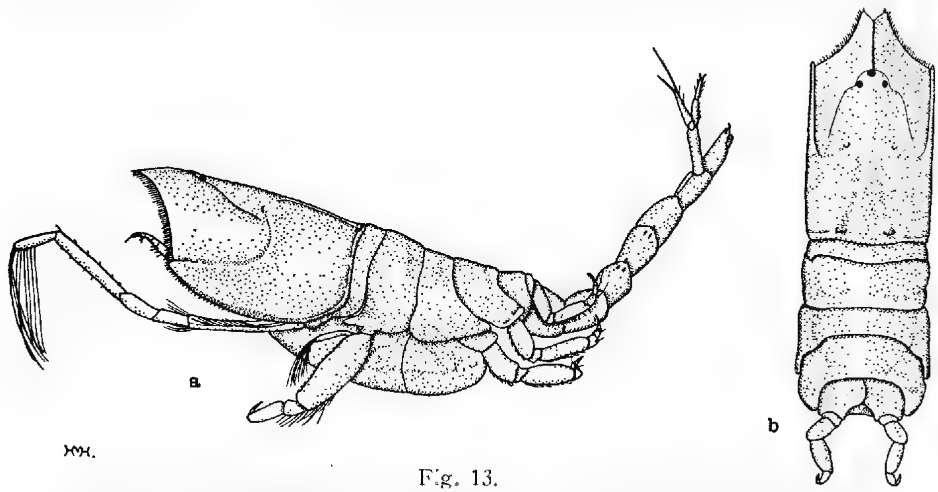


Fig. 13.
Gynodiastylis truncatifrons, type female. a, Lateral view; b, dorsal view of cephalothorax (x 12).

apically, and armed with two apical and two subapical tiny hooked spines. First antennae with basal joint as long as second and third joints together, and with second joint two-thirds as long as third. Dactylus of third maxillipeds a little shorter than either of the three preceding joints, which are subequal in length. First legs stout and extending well beyond pseudorostrum, the ischium reaching to level of antennal notch; basis shorter than remaining joints together, with setae and a few spines on inner edge, and with a plumose seta and a spine at distal end; ischium and merus subequal in length, each with a spine at distal end of inner edge; carpus nearly three times as long as merus, and two and one-third times as long as propodus, which has the distal part of inner edge oblique and furnished with long setae; dactylus short. Basis of second legs distinctly longer than remaining joints together, less than three times as long as broad, furnished with short, stout spines on inner edge, and plumose setae on outer margin; ischium not distinct and merus nearly half as long as carpus. Third to fifth legs stout, with basis shorter than remaining joints together. Third legs articulated near posterior end of their somite, with the attachment directed almost backwards, so that there is a wide gap between second and third legs. Attachment similar in last two pairs of legs, the fifth being articulated dorso-laterally. Uropods with peduncle little longer than telson and nearly one-third as long again as endopod; exopod about five-sixths as long as endopod, with two long unequal apical

bristles and a few bristles and hairs on each edge; proximal joint of two-segmented endopod longer than distal, which is furnished with two short, stout, curved apical bristles and some hairs and a subapical spine on inner edge; inner margin of first joint of endopod with a sparse fringe of hairs and two spines, one apical and the other at the middle of length. Colour white.

Length, 7·2 mm.

Loc.—South Australia: Gulf St. Vincent, five miles off Semaphore, 5 fath. (H. M. Hale). Type, female, in South Australian Museum, Reg. No. C. 1754.

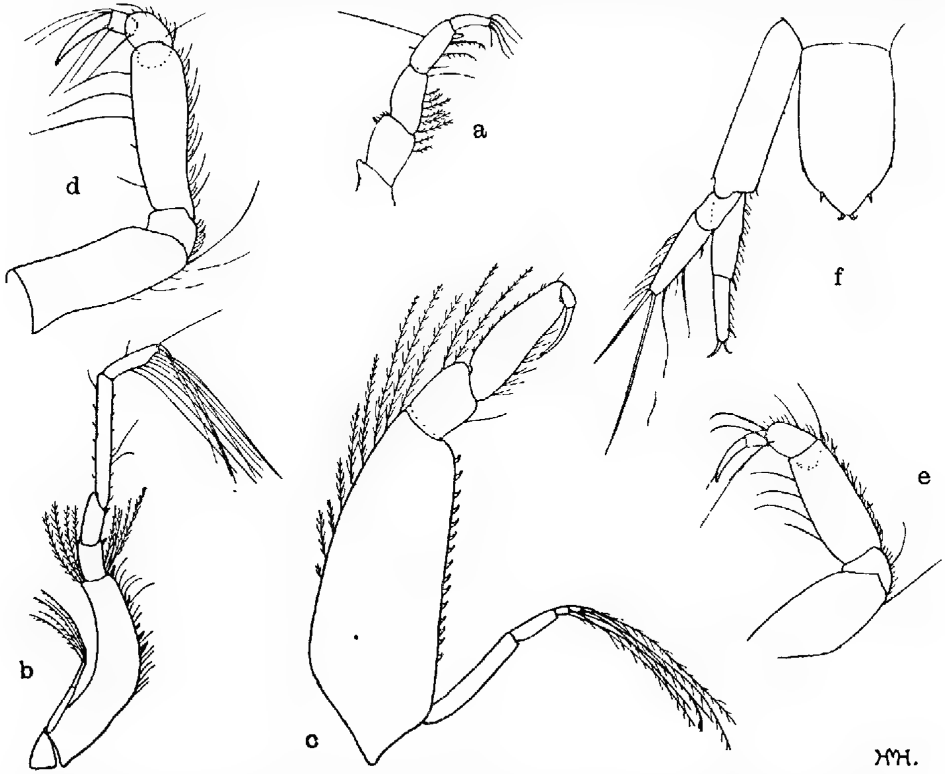


Fig. 14.
Gynodiastylis truncatifrons, type female. a, Terminal part of third maxilliped (x 42); b, first leg (x 17); c, second leg (x 42); d, fourth leg (x 42); e, fifth leg (x 42); f, telson and uropod (x 42).

A single adult female with a few advanced young in the brood pouch was taken in a bottom dredge; the juveniles are representatives of at least two stages. This species may be distinguished at a glance from the preceding, and from the two aforementioned Western Australian species by the longer first legs and abdomen, by the shape of the carapace, the presence of a single ridge on each side of the carapace, the character of the uropods, etc.

Anchicolurus, Stebbing.

Anchicolurus waitei, n. sp.

Adult female. Carapace pitted, less than one-third the total length, and as long as the five free pedigerous segments together; its vertical height two-thirds dorsal length; sides with a depression at the antennal border, and with a low ridge, curving backward and upward to the dorsum, from the edge of the anterior depression. Pseudorostral lobes not very long, subacute. Antennal notch wide

and shallow, and antennal tooth acute. Ocular lobe short, wider than long. First and second pedigerous segments short; pleural parts of third greatly produced behind, and overlapping second segment in front. Dorsal length of fourth segment greater than that of the three preceding somites together; fifth segment about three-fourths as long as fourth. Pleon four-fifths as long as thorax; sixth somite two-thirds as long as fifth, and slightly longer than telson, which is rounded, without spines or setae, and with the tip not extending beyond the anal valves. First antennae with second segment stouter than, but subequal in length to, third, and shorter than first; outer flagellum three-jointed, and accessory flagellum very tiny and two-jointed. Third maxillipeds with well-developed exopods; basis slightly expanded and produced to level of apex of ischium at distal end, which bears a series of plumose setae. First two pairs of legs with large exopods, third and fourth pairs with rudimentary, two-jointed exopods. Carpus of first legs reaching forward to antennal angle; basis about one-fifth as long again as rest of limb; carpus distinctly longer than propodus, which is longer than dactylus. Basis of second legs somewhat expanded, about four-fifths as long as distal joints together; ischium short and merus a little longer than carpus; propodus and dactylus subequal in length, each shorter than carpus. Third to fifth legs stout, with merus as long as, or longer than, basis, and ischium and the three distal joints short; third legs widely separated from second.

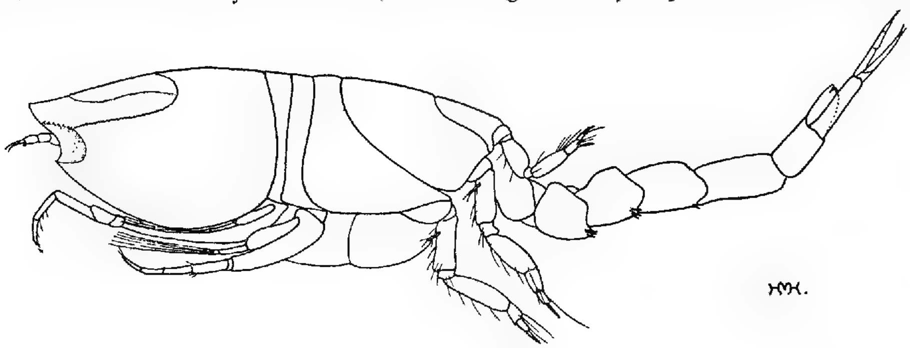


Fig. 15.
Anchicolurus waitei, type female (x 30).

Peduncle of uropods less than twice as long as telson, with slender spines on inner margin; endopod about as long as peduncle and slightly longer than exopod, three-jointed, the first joint scarcely twice as long as second, which is not quite twice as long as distal joint; apex of endopod with one spine, and inner margin with about eleven spines; exopod with two long and two short apical spines. Colour white.

Length, 3·7 mm.

Adult male. Differs from the female in having the form a little more slender, the third legs not widely separated from the second, and the exopods of the legs stouter, those of the third and fourth pairs being well developed, with the peduncle almost as wide as long. The telson is very slightly longer than in the female, with the rather narrowly rounded apex projecting beyond the anal valves and tipped with two short setae. The marginal spines of the uropods are more distinct and the peduncle is one-fourth as long again as the endopod; the inner border of the peduncle bears nine spines and the inner edge of the endopod fourteen, ten on the first joint, three on the second, and one on the distal segment; the last joint also bears a long apical spine and two smaller spines on the outer margin, while the outer edge of the second joint is furnished with two spines; the exopod has two long and two short apical spines, and spines on the outer margin. The

first antennae have the outer flagellum five-jointed and the accessory flagellum three- (? four) jointed, and as long as the first two joints of the outer lash together; the base of the proximal joint of the last-named bears a brush of thick sensory "hairs." The lash of the second antennae is fully as long as the body.

Length, 3·7 mm.

Loc.—South Australia: Robe, 3 fath. (Edgar R. Waite). Type, female, in South Australian Museum, Reg. No. C. 1751.

This species falls into the family Colurostylidae of Stebbing, and, apparently, is referable to *Anchicolurus* on account of the three-jointed endopod of the uropoda; its inclusion in *Anchicolurus,* however, narrows the definition of that

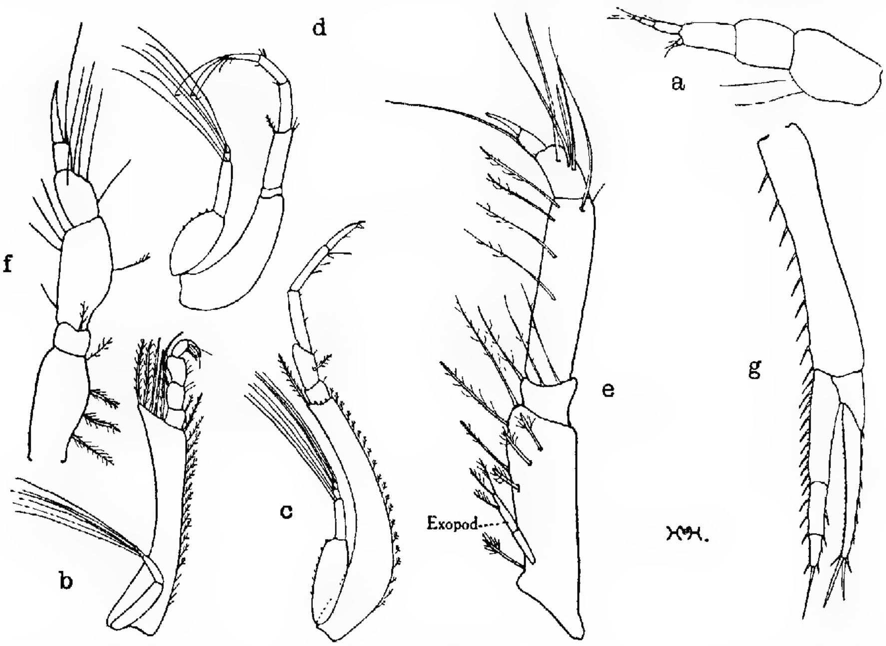


Fig. 16.
Anchicolurus waitei, paratype female. a, First antenna (x 100); b, third maxilliped (x 42); c, first leg (x 42); d, second leg (x 42); e, third leg (x 100); f, fifth leg (x 100). g, Uropod of paratype male (x 100).

genus. In the form of the pedigerous somites and in the character of the third maxillipeds, *A. waitei* resembles *Colurostylis pseudocoma,* Calman, rather than the genotype of *Anchicolurus,* while the propodus of the second leg is not longer than the dactylus, but, as mentioned, approximately equal to it in length.

LEPTOSTYLIS, Sars.

Leptostylis vercoi, n. sp.

Ovigerous female. Carapace more than one-third total length and twice as long as the five pedigerous somites together, its vertical height about two-thirds the dorsal length; back subcarinate owing to a longitudinal depression on each side of the mid-line, and with dorsal margin (as seen from the side) curved; surface spinulose and antero-inferior margins serrulate. Pseudorostral lobes short, apically acute. No distinct antennal angle. First two pedigerous segments short; third, fourth, and fifth each with pleural parts produced slightly backwards. Pleon a little longer than cephalothorax. Telson as long as sixth pleon segment, with one pair of apical spines, but no lateral armature. Third joint of first

antennae very much longer than second, accessory flagellum tiny. Third maxillipeds with well-developed exopod; basis widened distally but not produced, the lateral margins and rounded apex with plumose bristles, the apical setae stouter and longer than the others. First legs long and slender, projecting for half their length beyond the pseudorostral lobes when horizontally extended; basis narrow, curved, more than half as long as remaining joints together, somewhat triangular in section, the lower edge armed with numerous stout spines and lateral margins with plumose setae; ischium shorter than merus; carpus abruptly narrower than preceding joints, more than twice as long as merus and three-fourths as long as the slender propodus; dactylus two-thirds as long as propodus, with a few apical setae; apart from the last the distal joints bear a few inconspicuous short hairs but no long setae. Basis of second legs stout, armed with spines on inner edge and setae on outer; ischium short and carpus narrower than merus, and about

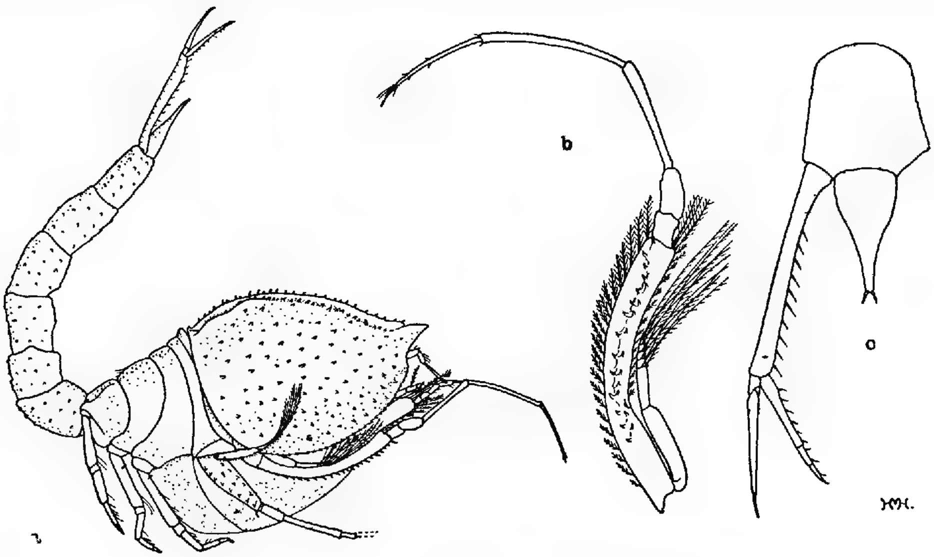


Fig. 17.
Leptostylis vercoi, type female. a, Lateral view (x 13); b, first leg (x 26); c, sixth pleon somite, telson, and uropod (x 26).

twice as long as ischium and merus together; propodus about as long as merus. Remaining legs moderately stout, with basis long and (excepting in fifth legs) much longer than merus; third legs separated from second, but not greatly. Peduncle of uropods one and three-fourths times as long as telson, armed with about ten spines on inner edge; rami of equal length, each slightly shorter than telson; exopod with a single apical spine and no other armature excepting for a feeble serration near the base of distal joint; endopod three-jointed, the first joint twice as long as the other two together; distal joint three-fourths as long as second; inner edge of endopod with nine slender spines (six on first joint, two on second, and one on third), and apex with one short, stouter spine. Colour white.

Length, 8 mm.

Loc.—Western Australia: Geographe Bay, 15-16 fath. (Sir J. Verco). Type, female, in South Australian Museum, Reg. No. C. 1768.

A single specimen was dredged fourteen years ago. The species is apparently close to *L. mancus,* Sars; as in the last-named, the rami of the uropods do not differ in length, but the legs of the new species are different and the telson has no lateral spines.

AUSTRALIAN SPECIES OF THE ISOPOD FAMILY SPHAEROMIDAE (Continued).

By W. H. Baker.

[Read March 8, 1928.]

Plates I. to VI.

The following paper is a continuation of one submitted to this Society in 1926, in which I dealt with species—among others—in the collection of the Australian Museum, Sydney. Through the kindness of the authorities of the Western Australian Museum, I have had the opportunity of recording some more Western Australian forms, together with some which have come to hand since from our east and south coasts.

Sphaeroma walkeri, Stebbing.

Sphaeroma walkeri, Stebbing, Rep. Isopoda (collected by Prof. Herdman at Ceylon), 1902, p. 31, pl. vii.

The present specimens are from Blackwattle Bay, Darling Harbour, New South Wales.

Found not attacking timber, but were taken from surface growths. Report by inspectors.

Exosphaeroma serventii, n. sp.

Pl. i., figs. 1, 2.

The body of this elegant species is marked like many oniscids with a ground of slaty colour with small irregular lighter areas arranged on each side of a darker median region, these lighter markings are much smaller and more numerous on the anterior division of abdomen and much less numerous on the posterior division. The head is short with a small anterior transverse ridge continuous with a slight rostral elevation. The eyes are conspicuous. The segments of thorax are subequal in length, the 1st being a little shorter than the head; a very shallow longitudinal depression on each side marks off the epimera, which are obtuse. The anterior division of abdomen is short, the posterior evenly domed, but towards the end shelving off less steeply, the end is moderately pointed. The antennule has a flagellum of 12 joints. The peduncular joints of the antenna are stout, rather short, and the flagellum has 16 joints, the setae are in small groups. The epistome is elongate, pointed obtusely anteriorly, where it curves towards the rostrum. Mandibles slender, the left with 4-toothed primary plate, secondary trifid, nearly as large as primary. Spine row present; there is a well-developed molar. Maxilliped large with distal plate of 2nd joint about half as long as the whole joint, with strongly setose crown, palp large, the fringes of lobes well developed, 2nd, 3rd, and 4th joints each with distal posterior setum. Legs robust, sparely spined, but with dense fur. Filaments of 8th sternite short and converging. Pleopoda with long fringes on the usual rami; 1st pleopod with short peduncle and 5 coupling spines, and the outer side with coarser fur than usual; outer margin of endopod straight, inner thickened, there is no outstanding spine at base of exopod (in type specimen). 2nd pleopod with rather thick appendix reaching to end of endopod, 3rd, 4th, and 5th pleopods with rami as in *E. calcareus,* except that the endopod on the 4th carries few branchial rugae.

This species is near *E. calcareus,* Dana, *E. falcatum,* Tattersall, and *E. bicolor,* Baker.

The non-ovigerous female has the abdomen a little less pointed and the legs less robust and not furry. The marsupial plates are rudimentary.

Length of male, 7 mm.

The specimens are from Pallinup Estuary, Western Australia, and were collected by D. L. Serventy, 11625, Western Australian Museum.

ISOCLADUS EXCAVATUS, Baker.

Pl. i., fig. 3.

Zuzara (Isocladus) excavata, Baker, Trans. Roy. Soc. S. Austr., vol. xxxiv., 1910, p. 84, pl. xxiv., figs. 4-6.

This Western Australian specimen seems to be older than the type. This I propose as a co-type with the following characters. The head is very short, steeply abrupt in front. The epimera are separated from the tergites by well-marked longitudinal grooves and are especially prominent on the 5th and 6th segments; on the 6th there is a small tubercle in the groove and one submedian on each side just above those that occur on the 7th segment. The process of the 7th segment is contracted behind to a point (this is probably the correct condition, that occurring in the type being a slight malformation). The anterior division of abdomen is short and tumid medianly. The posterior division is nearly flat (convexity rather exaggerated in figure) with a faint median depression above and a slight lateral furrow round the two sides meeting behind; the immediate end is slightly raised.

Length, 7 mm.

The single male specimen is from Cottesloe, Western Australia; collected from a rock pool by L. G. Glauert, placed in Western Australian Museum, 10607.

NEOSPHAEROMA PLUMOSA, Whitelegge.

Sphaeroma plumosa, Whitelegge, "Thetis" Scientific Results, Isopoda, pt. ii., p. 254.

Cymodopsis plumosa, Baker, Trans. Roy. Soc. S. Austr., vol. l., p. 265, pl. xlv., figs. 6-9.

Two male specimens of this species have reached me; they are in better preservation than those dealt with in the above paper. There is no need of my further supplementing Mr. Whitelegge's description, except that I have noticed that the endopod of the 3rd pleopod bears a few branchial folds and the 4th pleopod has on both exopod and endopod some plumose setae.

The specimens are from 20 fathoms off coast, New South Wales. Presented to Australian Museum by Mr. C. W. Mulvey.

CYMODOCE BIDENTATA, var. TASMANICA.

Pl. ii., fig. 1; pl. iv., fig. 9.

The abdomen is hairy with tufts of longer hairs on the tubercles. On the posterior division there is an obscure tubercle almost under each of the two submedian projections of the anterior division, posterior to these there are a pair of tubercles on each side of the middle, the inner-more ones spiniform, the outer scarcely raised, then a median spiniform tubercle on the basal portion of the median process of the notch, and again two more side by side at its end. There is a small tubercle on the peduncular portion of the uropod above and the inner ramus has the end double-pointed.

The single specimen is from Simpson's Bay, D'Entrecasteaux Channel, Tasmania, dredged by scallop fishers in 8-15 fathoms. It is placed in the Australian Museum, Sydney.

CYMODOCE CORONATA, Haswell.

Pl. ii., figs. 3, 4.

Cymodoce coronata, Haswell, Cat. Austr. Crust., p. 292, and Trans. Linn. Soc. N.S. Wales, vol. vi., p. 10

The body is covered with very small black dots. Anteriorly the segments are nearly smooth, but posteriorly they become coarsely pubescent and granular. The head is evenly rounded with a very slight anterior transverse ridge. The eyes are prominent and large. The segments of thorax are subequal in length, the epimera are more or less acute at their posterior angles except the last, which is rounded, and falls short of their inferior level. The anterior division of abdomen is short with two submedian tubercles on its posterior border (these are very variable in size and projection). The posterior division is not very convex, it is marked by two tubercles just external to and below the two of the anterior division and two behind these nearer together, and often with points turned up (these tubercles vary much also). The deep notch of the posterior border has the median process raised and ends obtusely reaching as far as the sides of notch; an oblique sulcation from near the insertion of the uropods reaches down to the median process of the notch on each side. The epistome is short, anteriorly tumid, and has short limbs; the upper lip is transversely sulcate. The basal joint of the antennule is about twice as long as broad, its anterior distal angle is short and obtuse, the posterior reaches to near the end of the 2nd joint; the 2nd joint is small; the flagellum carries 20-30 joints. The antennal flagellum carries 34 joints. The mandibles are short and stocky, with incisory plates entire, the secondary plate on the left is close to the primary, also entire, spine row is insignificant, the molar is short, there is a strong palp, the 1st and 2nd joints of which are expanded and subequal in length. The maxilliped has crown of plate of 2nd joint with pectinate setae not very crowded, some longer setae are on the inner border, lobes of palp well developed, the crowns of each with short setae rather crowded, 2nd and 3rd joints each with a posterior setum. The legs are long and well spined; the 1st has a series of thorn-like spines on merus, carpus, and propodus, and also a small patch of fur on ischium. The merus and carpus of the following legs have furry pads on the usual joints, but this condition becomes less on the more posterior pairs; the last two pairs are well provided with spines. The filaments of the 8th sternite are rather small and slender. The 1st pleopod has the peduncle short with four or five coupling spines which appear shorter than usual, the outer side is a little depressed and densely furry; the exopod has a slightly sinuous outer margin and becomes a little broader at the end and has a large proximal spine; the inner ramus is triangulate. The appendix on the 2nd pleopod is long and very slender. The endopod of 3rd pleopod has an oblique ridge near its inner proximal angle, its outer margin is very convex. The distal end of exopod of 4th pleopod has six or seven plumose setae; the endopods of 4th and 5th pleopods are large with crowded branchial folds; the exopod of 5th pleopod has the distal division rather narrow with an outstanding apical squamose lobe, and just below it another outstanding and longer, also on the inner border a scarcely raised lobe; on the proximal division there are two smaller lobes, both outstanding, at the inner distal angle. The uropods are indurated, very setose, the inner ramus is subfusiform, reaching beyond the end of abdomen, ending in a small tooth, the outer ramus is shorter, ends very acutely, is nearly straight on its outer margin, convex on its inner.

The female of this species has mouth parts modified. It is less pubescent than the male and scarcely granular. The posterior division of abdomen is obscurely divided into two lobes or domes, and at the end is pointed with the

notch almost obliterated. The inner ramus of uropod does not reach the end of abdomen, it is nearly oblong, narrow, truncate at end, the outer ramus is shorter, very slightly sigmoid and distally acute.

Numerous specimens are placed in South Australian Museum.

Length of neotype, 17 mm.

I am informed through Mr. F. A. McNeil, Zoologist of the Australian Museum, Sydney, that the types specimens of *C. bidentata,* Haswell, and *C. coronata,* Haswell, are missing, consequently, as my identifications have been taken from the descriptions extant, which are not accompanied by figures, there is a certain amount of doubt in each case. Under the circumstances, I would now propose the present description of *C. coronata* as neotype held by the South Australian Museum.

CYMODOCE CORONATA, Haswell, var. FUSIFORMIS.

Pl. ii., figs. 2, 5-8.

This variety differs from the foregoing species in the following points. The covering is a short pubescence through which longer hairs protrude, this is easily brushed off; the body is also more granulate, being much less smooth anteriorly. The epistome and basal antennular joints are rougher with hairs and granules. The posterior margin of the anterior division of abdomen carries six tubercles, two submedian are larger and more outstanding, differing in length and projection in various specimens. The posterior division has the median process of the notch with a wide raised base and a slight sulcation above it, and close to its end is a small bifid tubercle; the sides of the notch are acute and double-pointed. The peduncle of the uropod carries a tubercle above; the inner ramus tapers to a terminal tooth in a much greater degree than in *C. coronata,* and there is a small tubercle just above the end. The outer ramus is much shorter approaching that of *C. bidentata.* There are also slight differences in the females. In this variety the two slight domes of the posterior division of abdomen are each surmounted by a small tubercle. The pubescence is coarser and more plentiful, and the abdomen is much more pointed in the non-ovigerous female.

The species and variety are very common on the southern coast of Australia. Numerous specimens have been placed in the South Australian Museum.

CYMODOCE CORONATA, var. INTERMEDIA.

Pl. ii., fig. 9.

A second variety is represented in the figure. It will be seen to be of an intermediate character.

CYMODOCE MULTIDENS, var. AUSTRALIS.

Pl. i., figs. 4-6.

Cymodoce multidens, Richardson, Marine Isopods collected in the Phillipines by U.S. Fisheries Dept., Commerce and Labour, Bureau of Fisheries, 1907-8, p. 27, fig. 26.

The body is rough with rather small granules which in parts become spiniform, very rigid and brittle. The head is narrow and anteriorly depressed where there are two submedian spiniform teeth with one median on the rostrum and two or three spinuliform granules anterior to each eye. The eyes are rounded and of moderate size. The 1st thoracic segment is longest, the remaining segments are short and nearly equal in length; the epimera of the 5th and 6th segments are squared and those of the 7th shortened. The anterior division of abdomen is short and somewhat thickened on its posterior border, the posterior division is scarcely domed, with a slight oblique ridge on each side bearing a few spinuliform granules. The posterior notch is not deeply cut, the median process is equal to the lateral and on the same level, there is a wide insinuation below

but no channel. The antennules are visible from above when the body is extended, the basal joints bear many bristle-like hairs and a crest of nine small pearly teeth with two larger ones posteriorly on each, the remaining joints are also very setose, as also the flagella, which are short with eight joints. The antennae are also very setose, the flagella of eight or nine joints. The epistome is small and consists of a rough forward portion reaching the rostrum, behind which are three transverse teeth, the lateral limbs also are marked with similar teeth. The mandibles are slender, with bifid incisory plates. The left mandible has secondary plate, spine row and molar normal. The palp of maxilliped has long lobes like that of *C. tuberculosa*, Stebbing. The legs are well spined with longer ones on the more distal joints. The filaments on the 8th sternite are well developed, as also the appendix on the 2nd pleopod, the end of which is slightly hooked. The peduncle of the 1st pleopod has four slender coupling spines and its outer side is hairy; the exopod, which is nearly oblong, has the outer proximal angle overreaching the peduncle. The endopod of the 3rd pleopod is abruptly angled distally. The exopod of the 5th has three squamose lobes slightly outstanding. The uropods are highly indurated and sublinear, the inner ramus curved outwards with a row of teeth on the underside and is coarsely setose and distally bifid. The external ramus is shorter, rough, with teeth, and also bifid and setose.

The ovigerous female of this variety is much larger than the male. The head is not depressed like it, the teeth on the forehead are absent, those on the epistome and 1st joints of the antennules are present but much smaller. The body is almost smooth. The posterior division of abdomen does not taper so much behind and the notch is less evident, marsupial plates are present but the eggs are within the body. The mouth parts are modified, but the palpal lobes of maxillipeds retain their setose condition. The uropods are similar to those of the male.

Length of male, 7 mm.

The specimens are from Western Australian coast; 10484, 10385, Western Australian Museum, collected by L. G. Glauert.

Cymodoce aculeata, var. grandis.

Pl. i., figs. 7, 8.

Cymodoce aculeata, Haswell, Cat. Austr. Crust., p. 291, and Baker, Trans. Roy. Soc. S. Austr., vol. l., 1926, p. 257, pl. xl., figs. 7, 8.

This fine variety agrees well with the type, except that the outermost tubercles on the posterior division of the abdomen are obsolete. This division also has two small oblique ridges below the outermost tubercles, very setose, as also is the base of the median process of the notch; the surface is minutely granular at the sides.

Length of male, 39 mm.; breadth, 19 mm.

Specimens are placed in South Australian Museum.

Cymodoce longistylis, Miers.

Pl. vi., figs. 1-4.

Cymodoce longistylis, Miers, Voyage of the "Alert," p. 305, pl. xxxiii., fig. C.

The present specimens are from Port Hacking, New South Wales, collected by Dr. C. Anderson.

The body is very hairy, many of the hairs being plumose. The forehead has a continuous ridge between the eyes. The median process of the abdominal notch is lingulate seen from below, on each of the three termini formed by the notch and process there is a small upstanding tubercle. The epistome is covered with large granules. The mandibles have entire incisory plates. The legs are well provided with spines.

Cilicaeopsis sculpta, n. sp.

Pl. iii., figs. 5-7.

The anterior region of the head is highly sculptured, there is a prominent rostral portion with prominences on each side, and these flanked by lobes close to the eyes. The eyes are large. The posterior margins of each of the thoracic segments except the 1st have a row of strong backward curved teeth. The anterior division of the abdomen is granulate with some larger dentiform on the dorsal region, posteriorly there is a long process which is finely granular and projects backwards well beyond the end of abdomen but not so far as the uropods, it is rather slender and bifid at the extremity. The posterior division consists of two granulate and setose domes separated by a sulcus, each dome has one or more teeth on its summit. The surface then descends abruptly to the posterior margin, which is medianly cut by a semicircular notch transversely shallow but with a deep channel, the exit of which is acutely toothed, with another tooth higher up on each side. The epistome is highly sculptured, it has a median prominence curved backwards, on its lateral limbs there are three or four tubercles on each.

The basal joints of the antennules have each a longitudinal row of three or four tubercles. The 2nd joint of the antennule is small and has a small tubercle above, the 3rd joint is very slender and longer, the flagellum has 14 joints. The flagellum of the antenna has 14 or 15 joints. The mandibles are robust with a few small tubercles on their basal portions, incisory plates entire, the left mandible with slightly bifid secondary plate. The palp of the maxilliped has long lobes. The legs are robust and sparingly spined without furry pads. The 1st pair have small spines on merus, carpus, and propodus, the dactyles are short and two-clawed. The filaments on 8th sternum are long and slender. The exopod of the 1st pleopod has a small proximal spine on the outer side, the endopod is triangular and rather broader than long, there are three coupling spines on the peduncle. The 2nd pleopod is similar, the appendix is small and reaches about as far as the fringe of its endopod. The inner rami of uropods are reduced to two small spiniform tubercles. The outer rami are very large, rough with tubercles, club-shaped, covered densely with short setae, each ramus spreads very widely.

This species resembles *C. granulata,* Whitelegge; also *C. whiteleggei,* Stebbing, differing especially in the much reduced inner ramus of uropod.

Length, 12 mm.

Locality, Cottesloe, Western Australia. Col. L. Glauert.

The type is in the Western Australian Museum, Nos. 10850, 10672, 10496/10501.

Paracilicoea gigas, n. sp.

Pl. iii., figs. 1-4.

The body is covered with a very short pubescence and many small pearly granules which become larger posteriorly. The head is rather longer than the 1st thoracic segment but much narrower. The eyes are large, 1st segment of thorax longest, the others are rather short when the animal is extended, the epimera are marked off by distinct sutures. The anterior division of the abdomen is large with the usual divisions well marked, and is a little produced behind medianly. The posterior division is large and divided into two domes not very salient, with a dimple each side of the median sulcus above; behind these the surface is tumid and abrupt to the end. The posterior notch has a much reduced median process and is deep in the vertical direction. The epistome is prominent and granular with a small median knob; the upper lip has a deep transverse sulcus. The basal antennular joints almost touch each other at their proximal posterior angles, the 2nd joints are small, the 3rd much narrower and, after the 1st, which is much longer, there are 40 very short joints to each flagellum. The legs are robust, and

in place of the furry pads on the usual joints there are crowds of small bristles among which are longer ones on the 1st pair. The internal ramus of the uropod is short, not reaching the end of abdomen; it is sublaminate and distally slightly truncate. The external ramus is long, indurated with a strong tooth on the outer side and subacute terminally.

The above characters are taken from a large specimen which is damaged and dry, and is evidently an adult male. This I have named as type. The following characters are of a young male (pl. iii., fig. 4) in the Western Australian collection which I name as co-type. The body is covered with an extremely short tomentum. The anterior division of abdomen is not produced behind. The posterior division divided into two lobes less salient than in the type specimen. The posterior notch is narrow and deep in vertical direction but with a pointed median lobe. Mandibles with incisory plates entire, the left with secondary plate slightly bifid; the basal portion of the mandible has a transverse ridge. The legs are rather spiny, especially the more posterior pairs. The endopod of 1st pleopod has an insinuation at its distal end, the peduncle carries four coupling spines, there is a larger proximal spine on the exopod, but it is not outstanding. The exopod of the 2nd pleopod exhibits an appendix approaching the whip-like character seen in other species. The rami of the 3rd are broad with the division line of the exopod quite near the end. The exopod of the 4th pleopod has two plumose setae, and the endopod has a distal notch. The exopod of the 5th pleopod is quite like that of *C. latreillei*, except that the principal squamose lobe is pedunculate.

The resemblance of this species to *P.* (?) *pubescens*, Ml. Edw. (see Trans. Roy. S. Austr., 1926, p. 262, and pl. xliii.) is remarkable, and in the case of the adult male a parallel condition occurs which I have noted in that species, viz., the uropods becoming cilicaeform. The young of the present species, that of *P. pubescens* and that of *C. latreillei*, are very difficult to distinguish; this applies in a slightly less degree to females of the same species.

Length of large specimen (male), 35 mm.; breadth, 20 mm.; length of smaller male, 25 mm.; breadth, 15 mm.

Type in South Australian Museum, co-type in Western Australian Museum.

Paracilicoea flexilis, n. sp.

Pl. iv., figs. 1-4.

Head evenly rounded in front, 1st thoracic segment of about the same length as each of the remaining ones of the thorax. The body is smooth, glabrous, but becoming setose behind, a slight longitudinal groove marks off the epimera, which are uniform, the last produced a little deeper, a small notch shows on the posterior border of the 2nd and 3rd; the posterior margin of the 7th segment of thorax shows two slight submedian prominences behind. The abdomen is tuberculate and setose, the tubercles are numerous, being more or less spinuliform, and arranged mostly in longitudinal rows. The anterior division is very short, marked with the usual lines; the posterior not very convex; the posterior margin is conspicuously 3-lobed, with a broad and shallow channel below. The epistome is small and the labrum covered with brown dots. The antennule has a stout basal joint, the 2nd about one-third the length of the 1st, the narrow 3rd joint is only a little longer than the 2nd, the flagellum about the same length as the peduncle, the joints about 19 in number and very short. The antennal peduncle has short joints and a flagellum of 25 joints, very setose. The mandibles are very strong with entire incisory plates, in the left the secondary plate is very obscurely tridentate, the spine row is well developed, and there is a strong short molar with some dark spines on its inner margin. There is a large posterior lip. The 1st maxilla has a strong external ramus terminated by seven or eight strong spines

much worn and none are pectinate, the inner ramus has four curved pectinate spines. The 2nd maxilla is trilobed, the lobes short and reaching the same level, they bear some simple and pectinate spines. The maxilliped has the 2nd joint and its distal plate rather narrow, the palp has the 2nd, 3rd, and 4th joints with rather short lobes strongly setose, the terminal joint is just a little longer than the preceding one; there is a strong setum on the outer end of the 2nd joint of palp. The legs are robust. In the 1st the merus, carpus, and propodus have stout spines, the rest of the legs are sparsely spined but provided with furry pads on the usual joints. The filaments on the 8th thoracic sternite are slender. The 1st pleopod has a broad short peduncle with dense fur on the outer side and four coupling spines on the inner, the endopod is slightly longer than broad, the exopod, which lies obliquely, has a dense fringe and a proximal spine turned upwards. In the 2nd pleopod the appendix is short, reaching only to end of the endopod. The exopod of the 4th pleopod has a fringe of short setae on the whole of its external border, these become longer and plumose at the end, the endopod is very strongly marked with rugae and has an insinuation at the distal end. The exopod of the 5th pleopod is rather narrow, with a very oblique division, the distal part bearing three prominent squamose lobes, the proximal part with one lobe and a small one below it. The inner ramus of the uropod is very small, the outer is very long, curved inwards, and excavate on the inner side.

Length, without the uropods, 19 mm.; breadth, 9 mm.; uropods, 9 mm.

The non-ovigerous female of this species differs from the male in the following characters:—It is smaller, glabrous. The posterior division of abdomen is obscurely divided into two lobes or domes and the notch is not so deeply cut. The uropods are of ordinary shape and size and the rami subequal.

The specimens are from Cottesloe, Western Australia; collected by L. G. Glauert.

Type in Western Australian Museum, Nos. 10608/10617.

Dynoides barnardii, n. sp.

Pl. vi., figs. 5-7.

The surface of the head is rather rough and an interorbital ridge is well marked. The segments of thorax bear minute granules disposed transversely. The margins of epimera have hairs so closely compacted as to appear membrane-like, resembling conditions found in many of the flat forms of Sphaeromidae. The epimeron of the 6th thoracic segment over-reaches that of the 7th. The anterior division of abdomen is very short with sutures not visible, and the process behind extends as far as the inner end of the notch of the following division, the margin of this process has some spiniform granules. The posterior division of the abdomen is domed and minutely granulate, and shelves away to the margin gradually. The posterior notch is an elongate sinus with converging and denticulate sides meeting behind, at its inner end is a small lobe. The epistome is obtuse, apically curved forwards, with rough surface. The eyes are large. The 1st and 2nd peduncular joints of the antennule are large and rough as the epistome, the flagellum carries 12 joints, the 1st joint of which is much shorter than the 3rd peduncular joint. The antenna is robust with flagellum of 17 joints. The mandibles are weak. The left mandible has the incisory plate 4-dentate, there is a secondary plate and spine row with the molar quite close to these, its margin is finely denticulate. The palp has two strong spines terminating the 2nd joint. 1st maxilla has the inner branch bearing four long curved plumose setae. The outer branch with four or five strong teeth and three curved and serrate spines. The maxillipeds are slender, the 2nd joint has some small teeth on its outer margin, the distal plate is narrow, and its distal fringe has some large blunt teeth

among the setae. The 2nd joint of palp is largest, the 3rd less than half its length, the 5th joint is shorter than the 4th. The legs are robust, becoming longer posteriorly, most of the joints are densely and finely furred, with very few spines. The 1st pleopod has rather narrow rami, the exopod has an unusually long outstanding proximal spine arising from a small prominence, the peduncle carries two coupling spines on its inner angle, the endopod has a thickened inner margin, the fringes of rami are very long. The appendix of the 2nd pleopod is like that of *D. serratisinus*, its distal portion apparently lies in a half sheath formed by the inner margin of endopod. The filaments of the 8th thoracic sternum are united at their bases as in the above-mentioned species. The exopod of the 3rd pleopod is without division. The 4th and 5th pleopods are also as in Dr. Barnard's species. The uropods are large and lamellar, rough and covered with fine setules, and are minutely serrate on distal margins. Colour whitish with median and lateral brown areas on thorax, the anterior division of abdomen is brown, the domed portion of the posterior division is blackish with light spots, the pleopods are tinged with brown, as also are the uropods.

The genus *Dynoides* was established by Dr. Barnard for a South African species in 1914; the present species is from the coast of New South Wales, associated with *Sphaeroma quoyana*, Ml. Edw., *S. walkeri*, Stebbing. I have pleasure in dedicating this species to the author of the genus.

Dynamenella parva, n. sp.

Pl. iii., figs. 8-11.

The body is smooth and almost glabrous. The head is rounded and short. The eyes are large. The 1st segment of thorax longest, the 7th is longer than the 6th and longer than the anterior division of abdomen. The epimera are closely compacted together, those of the 6th and 7th segments are broader and rounded, the 7th reaching near to the level of 6th. The anterior division of abdomen is very short; the posterior is dome-shaped with a very faint median depression. The posterior notch is small and simple, almost cut in the vertical direction, so that it can only be seen when the animal is fully extended. The epistome is long, rather large, truncate anteriorly, and curved forward. The antennules are large; the 1st joint of peduncle not produced at its inner distal angle; the 2nd joint is large, the 3rd nearly equal to it in length, the flagellum of seven joints, five of which are long and subequal. The antenna also is robust, its flagellum carries 10 joints. The incisory plate of right mandible is slender, 4-dentate, row of spines and molar well developed and joint of palp subequal in length. Inner ramus of 1st maxilla with four curved setae, the outer ramus with the usual simple and branched spines. The 4th joint of the palp of the maxilliped has its lobe very short, the 5th joint is shorter than the 4th. The legs are strong, sparsely spined, but much clothed with soft woolly hair, the dactyles are short with secondary claws subequal to primary. The 1st pleopod has the endopod triangular, about as long as broad, with a small areolate area towards the inner proximal angle, bounded by a ledge on which the exopod rests. The exopod is larger, ovate, with small curved external proximal spine, the fringes are long, the peduncle is short with three coupling spines rather long, the outer side is bent towards the body. In the 2nd pleopod the peduncle is longer, the endopod is large with a thick appendix, which expands distally and considerably outreaches its end, the ovate exopod is a little smaller than the endopod and lies obliquely. The peduncle of the 3rd pleopod has straight sides, the endopod is larger than the exopod, which does not lie obliquely, and is without division. The exopod of the 5th pleopod carries a division and three outstanding squamose lobes; branchial folds on 4th and 5th pleopods are well developed on all rami. The

uropods are laminar, the rami are distally rounded, the outer much smaller than the inner.

Length of male, 3 mm.

Collected by H. M. Hale, Willunga reef, Gulf St. Vincent, South Australia. Type in South Australian Museum.

Moruloidea lacertosa, Baker.

Pl. i., figs. 9-11.

Moruloidea lacertosa, Baker, Trans. Roy. Soc. S. Austr., vol. xxxii., 1908, p. 150, pl. vii., figs. 1-10.

The female of this species differs from the male in not having such strongly developed antennae, and in having a median lobe in the posterior notch of the abdomen, the channel being deep. The mouth parts are normal, but the young are developed within the body. The head is very rugose and tuberculate.

In this species the method of folding the body—that is as a hinge about the middle—is similar to that of *cassidinopsis.*

A female specimen is in the South Australian Museum, which also holds the type.

Haswellia juxtacarnea.

Pl. iv., figs. 5-8.

Haswellia juxtacarnea, Baker, Trans. Roy. Soc. S. Austr., vol. l., 1926, p. 274, pl. xlix., figs. 6, 7.

In 1926 I established this species on a dry specimen from Lord Howe Island on account of its differences from the closely allied species *H. carnea,* Haswell. I am now able to add to that very short description the following notes with figures taken from one specimen from the coast of New South Wales, which has recently come to hand.

The greater part of the body is smooth and glabrous. The process of the 7th segment of thorax is minutely serrate on the lateral margins, it reaches slightly beyond the end of abdomen, with a small turned-down hooked process; dorsally there is a median keel, and below there is a shelf similar to that of *H. carnea.* The anterior division of abdomen is quite obscured; the posterior is very obscurely trilobed, and descends at first very abruptly, then with a gradual declivity to the terminal notch, which is very narrow, and filled by a narrow median process, which is slightly raised, and exceeds the sides of the notch. The basal joint of antennule is rough on the surface, the flagellum bears 17 joints. The flagellum of the antenna has also 17 joints. The mandibles are weak; the cutting plates are 4-dentate, and there is a small secondary plate on the left mandible. The legs are moderately robust, sparingly spined, except the first, which has a few thorn-like spines on the 4th, 5th, and 6th joints. The dactyles of all are short, 2-clawed, the secondary claw minute. The filaments on the 8th sternite are very short. The 1st pleopod has a broad and short peduncle, there are three coupling spines, and the outer margin has rather scanty furry hairs, the endopod is small, much broader than long, the exopod is scaly, on the surface the outer margin has six or seven thorns. The 2nd pleopod has a longer peduncle, its exopod is abruptly articulated at the outer angle; it is also scaly on the surface with 13 thorns on the margin; the short appendix originates from about the middle of the endopod, as in *cerceis,* etc. The uropods are granulate to spiniform and densely ciliate towards the margins of the rami, the inner ramus is broad, embracing the end of abdomen on its inner margin; the outer is about the same length, and is distally a little emarginate.

The single specimen was collected by Mr. M. Ward near Manly, ocean side, Port Jackson, New South Wales, and as co-type is placed in the Australian Museum, Sydney.

Haswellia glauerti, n. sp.

Pl. v., figs. 1-5.

The head is short, the segments of thorax do not differ much in length. Eyes are moderate in size. Process of 7th thoracic segment in the male covering the whole of the abdomen and closely applied to it, and also covers much of the uropods when they are retracted; it is moderately convex above but shelves away towards the end, which is obtusely pointed, the point turned down, and bears spiniform granules on the margin; there is a small lateral notch on each side at the proximal end. The epimera of the other segments are uniform, except those of the 1st segment. The posterior notch of abdomen is very large, triangular, with small median process. The epistome is sculptured, with the labrum rather large. The 1st and 2nd antennular joints are sculptured, the 2nd joints are rather large, and are embraced by the inner distal angles of the 1st by about half their length, the 3rd joints are a little longer than the 2nd, the flagella carry 15 joints. The antennal flagellum has 19 joints. The left mandible has a slender, entire incisory plate with a trifid secondary plate, a spine row and large molar. The maxilliped has a long palp, the lobes of joints well developed with long setae. The terminal joint is long. The 1st pair of legs is shorter but more robust than the two following pairs, there are large thorn-like spines on the merus, carpus, and propodus of the 1st. The rest of the legs are sparely spined and become longer and more robust posteriorly, they carry very short fur on the usual joints. The filaments of the 8th sternum are small. The pleopods are of the *cerceis* type. The 1st pair has a short peduncle and three stumpy coupling spines; the exopod has about eight small teeth at base of fringe, the endopod is much broader than long. In the 2nd pair the appendix is short, arising from the middle of its lamina, the exopod has 15 teeth on the margin, and from the surface of the endopod there arise three or four longish plumose hairs. In the 3rd pair the endopod is broad and the exopod with a division, the peduncle is longer than in the two preceding pairs. The exopod of the 5th pair is narrow, the distal division carries two lobes, both outstanding; there is also a small lobe on the inner margin of the proximal division. The uropods are sublaminar, the external ramus ovate and somewhat truncate, convex below, excavate above, bearing coarse granules and scanty hairs capable of a lateral setting towards the sides of the body; the inner ramus has an inner ridge below and is rather excavate externally from this.

In the same tube is a female specimen which evidently belongs to this species; it is about half the size of the male, and resembles the female of *H. emarginata*. The mouth parts are modified and the brood is probably internal. There is no process on the 7th thoracic segment. The anterior division of abdomen is rather tumid with the usual segments indicated, the posterior division is also tumid with a prominent knob which terminates a faint median ridge behind; the posterior notch is simple, deep in the vertical direction and semicircular. The epistome and antennular joints are not so sculptured as in the male. The body is covered with many black dots and is almost glabrous.

Length of male, 12 mm.

The specimens were collected from a sponge cavity, Cottesloe, Western Australia, by L. G. Glauert.

The type is in Western Australian Museum, 11795-11759.

Group PLATYBRANCHIATAE.

Section CASSIDININI.

Syncassidina, n. gen.

Body expanded, moderately convex dorsally, epimera spreading out obliquely. The only part not partaking in the outline being the anterior angles of the posterior division of abdomen. Margin fringed with small setules.

Antennules partially separated from each other by process of epistome, which shows wedge-shaped above, 1st and 2nd joints expanded, and upper surfaces in full view from above.

Epistome with pyramidal prolongation.

Mandibles normal.

Maxillipeds resembling *chitonopsis,* the 3rd joint of palp with small lobe occupying all the front.

Endopod of 1st pleopod narrow, about four times longer than broad.

Exopod of 3rd pleopod without division, both rami without long fringe.

No exopods to uropods.

Syncassidina aestuaria, n. sp.

Pl. v., figs. 6-10.

Body oblong-ovate, all segments reaching the margin except the anterior angles of the posterior division of abdomen. Margin strongly fringed, moderately convex. The anterior division of abdomen very short, not showing the lines of coalesced segments. The posterior division is convex, its anterior angles acute; there are two obscure median tubercles above, and the end is obtuse without notch or channel. Epistome with subpyramidal process; it is hirsute, and bears a large labrum, which rather obscures the lateral limbs and projects at nearly a right angle from the mandibles. Basal joint of antennule large, expanded, 2nd joint also expanded but much smaller, 3rd joint narrow and short; flagellum with five or six rather long joints, the antepenultimate one with small appendage which reaches to end of flagellum. Peduncle of antenna with 1st two basal joints rather broad, the following three subequal in length but becoming narrower, flagellum with 7 joints. Left mandible rather weak with small incisory plate 2-dentate consisting of a long and short tooth, secondary plate trifid, one curved spine and a moderate size molar and small palp. Right mandible with small incisory tooth and row of spines. The 1st maxilla has the outer ramus short with strong distal spines, one or two of which are finely pectinate, inner ramus slender with four curved plumose setae. 2nd maxilla trilobed. Maxillipeds with the plate of 2nd joint distally oblique, bearing several long pectinate setae, the 2nd palpal joint expanded without lobe, the 3rd with a small lobe occupying nearly all the front of the joint, 4th scarcely lobed, about the same length as the 5th, fringes scanty. Legs similar but becoming longer posteriorly, very sparsely spined, the 7th joints with primary and secondary unguis, giving chelate appearance. Peduncles of pleopods narrow. The 1st pleopod has the exopod ovate, the endopod narrow-oblong and about four times as long as broad; there are three coupling spines on the peduncle. The exopod of the 2nd pleopod is very convex on the outer margin and nearly straight on the inner, its endopod is wider than that of the 1st. The exopod of the 3rd pleopod is without division and has only a fringe of fine setules; on the inner margin there is a small insinuation. The exopod of the 4th pleopod is without division, the endopod is rather thick but without branchial rugae. The exopod of the 5th pleopod is much longer than the endopod, it has a division and is obtusely pointed at the end, there are two

squamiform lobes on the proximal portion, and the distal portion is squamose all over. The uropods are large, all trace of an exopod has disappeared.

Length, 5 mm.

The specimens, which appear to be all females, are from Rocky Bay, Swan River, Western Australia. Collected by L. G. Glauert.

The type is in Western Australian Museum, No. 11180.

DESCRIPTION OF PLATES I. to VI.

Plate I.

Fig. 1: *Exosphaeroma serventi*, n. sp. Fig. 2: *id.*, anterior region from below. Fig. 3: *Isocladus excavata*, Baker. Fig. 4: *Cymodoce multidens*, Richardson, var. *australis*, n. var., anterior region from below. Fig. 5: *id.*, posterior region from above. Fig. 6: *id.*, posterior region from below. Fig. 7: *Cymodoce aculeata*, var. *grandis*, n. var., posterior region from above. Fig. 8: *id.*, posterior region from below. Fig. 9: *Moruloidea lacertosa*, Baker, anterior region from below, female. Fig. 10: *id.*, posterior region from below, male. Fig. 11: *id.*, posterior region from below, female.

Plate II.

Fig. 1: *Cymodoce bidentata*, Haswell. var. *tasmanica*, n. var., posterior region from above. Fig. 2: *Cymodoce coronata*, Haswell, var. *fusiformis*, n. var., anterior region from below. Fig. 3: *Cymodoce coronata*, Haswell, posterior region from above. Fig. 4: *id.*, posterior region from below, female. Fig. 5: *Cymodoce coronata*, var. *fusiformis*, n. var., female. Fig. 6: *id.*, male. Fig 7: *id.*, posterior region from below. Fig. 8: *id.*, posterior region from above. Fig. 9: *Cymodoce coronata*, var. *intermedia*, n. var., posterior region from above.

Plate III.

Fig. 1: *Paracilicaea gigas*, n. sp., posterior region from above. Fig. 2: *id.*, posterior region from below. Fig. 3: *id.*, anterior region from below. Fig. 4: *id.*, posterior region of young male. Fig. 5: *Cilicaeopsis sculpta*, n. sp. Fig. 6: *id.*, anterior region from below. Fig. 7: *id.*, posterior region from below. Fig. 8: *Dynamenella parva*, n. sp., posterior region from below. Fig. 9: *id.*, male. Fig. 10: *id.*, epistome. Fig. 11: *id.*, 2nd pleopod.

Plate IV.

Fig. 1: *Paracilicaea flexilis*, n. sp. Fig. 2: *id.*, anterior region from below. Fig. 3: *id.*, posterior region, female. Fig. 4: *id.*, posterior region from below, male. Fig. 5: *Haswellia juxtacarnea*, Baker. Fig. 6: *id.*, posterior region from below. Fig. 7: *id.*, posterior region from above projecting segment of thorax and exopods of uropods removed. Fig. 8: *id.*, anterior region from below. Fig. 9: *Cymodoce bidentata*, var. *tasmanica*, posterior region from below.

Plate V.

Fig. 1: *Haswellia glauerti*, n. sp. Fig. 2: *id.*, anterior region from below. Fig. 3: *id.*, posterior region from below. Fig. 4: *id.*, posterior region from below, female. Fig. 5: *id.*, side view of posterior region. Fig. 6: *Syncassidina aestuaria*, n. sp. Fig. 7: *id.*, epistome. Fig. 8: *id.*, 1st leg. Fig. 9: *id.*, maxilliped. Fig. 10: 1st pleopod.

Plate VI.

Fig. 1: *Cymodoce longistylis*, Miers, abdomen from above. Fig. 2: *id.*, epistome. Fig. 3: *id.*, female abdomen from above. Fig. 4: *id.*, male abdomen from below. Fig. 5: *Dynoides barnardii*, male. Fig. 6: *id.*, anterior region from below. Fig. 7: *id.*, abdomen of male from below. Fig. 8: *Cilicaea curtispina*, Haswell. Fig. 9: *id.*, female.

FURTHER NOTES ON THE STRATIGRAPHY OF CENTRAL AUSTRALIA.

By Charles Chewings, Ph.D., F.G.S.
(Communicated by W. W. Weidenbach, A.S.A.S.M.)

[Read April 12, 1928.]

The discovery of *Cryptozoön* fossils at Acacia Well necessitated some little account of the stratigraphical succession of the beds, as seen by the writer, over the area drained by the Finke River and its tributaries, in Central Australia, hence the short summary contained in "Notes on the Stratigraphy of Central Australia."[(1)]

The sketch-map herewith is based on the writer's topographical map, with a few corrections added. Reference to the latest maps of the Northern Territory will elucidate districts and physical features referred to beyond the scope of this map.

Winnecke's Horn Expedition map has been quoted as one of his authorities by Dr. Ward, which is unfortunate because the map does not correctly portray the way the MacDonnell Ranges quartzite ridges run between the Finke and Ellery's Creek, as will be shown later on. It does not cover the ground west of Haast's Bluff. To use the names affixed by Winnecke to the hills in the Haast's Bluff area would entail much explanation and probably confuse the reader. The names affixed to mountains on the writer's original map will be used throughout this thesis.

The Finke Series.

Dr. L. Keith Ward's paper, entitled "Notes on the Geological Structure of Central Australia," is the latest valuable addition to the literature on the subject, particularly in regard to the stratigraphical succession in descending order to, and inclusive of, the Finke Series, which he, with some reservation, apparently, is prepared to fall in with Sir Edgeworth David and Professor Walter Howchin's suggested age, viz., Permo-Carboniferous. As this formation was seen to dip under the Cretaceous Shales at Mount Daniel, the writer and H. Y. L. Brown regarded the age as Jurassic (?). Judging from its general appearance and lithological character, the younger age would, in the writer's opinion, be more probable. However! Pending the discovery of fossiliferous evidence, the designation "The Finke Series" will indicate clearly the formation. The writer is in accord with Dr. Ward's reading, in that Mount Townsend appears to be about the northern limit of the Upper Cretaceous sedimentation, along the overland telegraph line; and that Mount Daniel, which is situated only a few miles south of Mount Townsend, represents, as far as can be seen, the northern limit of the Lower Cretaceous. The interesting point made clear by these limitations, provided the age of the Finke Series proves to be Permo-Carboniferous, is to push back the last time the MacDonnell Ranges region was under the sea—excepting the tops of the ranges—to Permo-Carboniferous times. A lengthy geological period must be allowed for the erosion and almost complete removal from its northern extensions of a rock formation of such magnitude, and it seems fair to assume that the Jurassic and Cretaceous rocks that occupy the Lake Eyre Basin were largely built up from this source. The Finke Series is the youngest, and was

(1) Trans. Roy. Soc. S. Austr., vol. xxxviii., 1914.

the last widespread sedimentation that transpired over the highlands in Central Australia, since which time continental conditions have persisted. For a fuller description of this formation *vide* the writer's former paper.[2]

The Stratigraphical Succession of the Palaeozoics.

H. Y. L. Brown changed his reading from time to time of the stratigraphical succession of the different rock formations occurring south of Alice Springs, whose physical features and lithological character are very similar. Tate and Watt, apparently, took little note of the lithological character and the disposition of the extensions of the Post-Ordovician beds, and, in particular, the fractured, jointed and disturbed state of the "lower" beds of their Ordovician when compared with the "upper." Dr. L. Keith Ward, while agreeing with Tate and Watt that the Heavitree Gap quartzite and limestones are of Ordovician age, is, strange as it may seem, for the same reason, at variance with them, for evidently he is of opinion that the Arltunga quartzites belong to an earlier sedimentation. It will be shown later on that Heavitree Gap and the Arltunga quartzites are the same formation.

No instance is on record of Ordovician remnants having been found interfolded with the Pre-Cambrian gneiss and schist in Central Australia. On the other hand, the Heavitree quartzites and limestones belong to a formation (Cambrian?) that was largely faulted down into and interfolded in, and with, the Pre-Cambrian. From Mount Udor in the far west, to Arltunga in the east, instances of this occur nearly the whole way, and in no case has more than one strong quartzite band been observed interfolded in the Pre-Cambrian at one place. The nearest approach to more than one are the Berry's Pass and Mount Liebig quartzite bands (or, as they will hereafter be designated, "ridges") which, in this case, appear to be the same band of rock forming the outer layer of a synclinal fold, interfolded as such, in the Pre-Cambrian. Had there been more than one quartzite (or perhaps then only sandstone) band in existence when that interfolding took place, surely in that great distance there would be some remnant showing more than one. And the same thing applies wherever the remnants happen to be, for in that long line—Stuart's Bluff Range—that starts as "Hann's Ridge," east of Ryan's Well, and runs west to Central Mount Wedge, there is only one strong quartzite band represented. We shall again return to this subject later on.

Dr. Ward, in his figs. 2 and 7, pp. 65 and 81, shows three quartzite bands in his stratigraphical succession of the sedimentaries along a section running south from Heavitree Gap, near Alice Springs. It may be that other bands are covered by alluvium along this section.

As regards the apparent conformity between the different sedimentary series:—The fact should not be lost sight of, that where the process of mountain building has been "long even pressure" from contraction, sufficient to throw sediments totalling many thousands of feet in thickness into more or less vertical position over a length of two hundred miles [The MacDonnell Ranges were at one time quite four hundred miles long], in all probability all traces of unconformity would be obliterated, except in very favourably-situated spots. Tate and Watt tried to discover an unconformity between the Post-Ordovician conglomerates and the sandstone and quartzite beds of Ordovician age. The effort resulted in the negligible result of only one degree of difference in the dip, notwithstanding that the older was already highly-tilted strata flanking a great mountain range when the younger was laid down.

(2) Trans. Roy. Soc. S. Austr., vol. xxxviii., 1914, pp. 42-46.

Winnecke's apocryphal map of the Horn Expedition shows the quartzite ridge in which the Finke Gorge waterhole is situated to be the same as the quartzite ridge in which the Ellery's Creek large waterhole occurs, which is both incorrect and misleading. The Mount Sonder—Ellery's Creek waterhole —Heavitree Gap quartzite ridge is the one that impinges on the Pre-Cambrian schists throughout its entire length. The Finke Gorge waterhole ridge—if continuous the whole way—is the next quartzite ridge south of the Ellery's Creek waterhole ridge. The two are separated by a broad valley of erosion, in the limestones of which *Cryptozoön* fossils were recently discovered by Messrs. Mawson and Madigan. No Ordovician fossils have yet been found in this valley. This discovery would seem to place the *Cryptozoön* horizon between the Heavitree Gap and Mount Blatherskite quartzite ridges (which corresponds with Dr. Ward's Nos. 1 and 2 ridges, respectively, *vide* his fig. 2, p. 65) in limestone bands standing well out from the Heavitree ridge, say one mile, which corresponds very well with the position the *Cryptozoön* beds at Acacia Well bear to the Heavitree ridge. The beds in each case are highly tilted, of course. Mawson and Madigan's discovery conclusively settles the point, viz., that the *Cryptozoön* beds are older than the known Ordovician fossil-bearing beds, for Tate and Watts place them outside (=above) the Blatherskite (No. 2) quartzite ridge, whereas the *Cryptozoön* beds are inside (=below) it. Much depends upon the determination of the geological age of the *Cryptozoön* beds, but even more depends upon determining the age of the lowest limestone and quartzite for, in the writer's reading, they represent the beds that were faulted down into, and became folded with, the schists. It is these latter that the writer regards as decidedly older than Ordovician. The writer is of opinion that Ordovician fossils may be looked for with confidence in one, or other, or both, of the next succeeding valleys to the south of the *Cryptozoön* valley. Winnecke's map, together with the incomplete succession of the sediments as shown in Tate and Watts' fig. 9 section, evidently led Dr. Ward astray, for on p. 66 he states:—"So the *Cryptozoön* specimens occur on the same stratigraphical horizon as *Orthis leviensis*." Taking Dr. Ward's block diagram, fig. 7, p. 81, as a guide, the writer thinks *Cryptozoön* fossils may be anticipated in the police paddock, and *Orthis leviensis* and other Ordovician fossils in the racecourse, or a little south of that. In other words, in his "Upper Limestone" beds, or perhaps above that even. As Dr. Ward was fortunate enough to find *Cryptozoön* fossils at Ooraminna, if the succession be similar there to, say, the Finke Gorge, one would look for Ordovician fossils in any limestone beds that may outcrop on the extreme northern and southern margins of that range. The writer's reading of the way the limestone beds occur in the stretch between Deep Well and Francis Well, on the overland telegraph line, in regard to the red sandstone beds (as seen at Deep Well, Mount Breaden, Mount Charlotte, and the Northern Percy Hills), is at variance with Dr. Ward's, as represented in his fig. 1, p. 63, No. 2. At Ooraminna the relative positions of the beds are correctly delineated. Why Dr. Ward reverses the order, and makes the limestone to superimpose the sandstone beds at Deep Well, is hard to understand. From Ooraminna to four miles south of Deep Well the limestone beds do not outcrop, but at the latter spot they come to the surface, and are seen to have a decided dip to the north. Three miles south of this spot, Mount Breaden (which is a massive and undoubted remnant of the Deep Well—Mount Charlotte red sandstone formation) is seen to repose "on" the limestone beds. Between Breaden Dam and Maryvale the beds of shale, grit, conglomerate, limestone, etc., that underlie the Ooraminna limestone (which limestone, by the way, represents the latest formed bed of that limestone series) are brought into view in a series

of sharp folds, in which some of the beds stand vertical. Nearer Maryvale the limestone beds dip south, and under the red sandstone beds of the Northern Percy Hills and Mount Charlotte.

Sequence at Finke Gorge and Goyder's Pass, and probably Ellery's Creek also.

Cambrian (?)

No. 1 Quartzite Ridge:
Mount Sonder, Ellery's Creek waterhole, Heavitree Gap ridge.—Dr. Ward's lower quartzite.
Between No 1 and No. 2 is the *Cryptozoön* horizon, proven by Mawson and Madigan's recent discovery.

No. 2 Quartzite Ridge:
Finke Gorge waterhole ridge. May represent Dr. Ward's middle quartzite.

Ordovician.

No. 3 Quartzite Ridge:
The second ridge from the *Cryptozoön* valley south. In this quartzite Tate and Watts found Ordovician fossils at Finke Gorge, and near Goyder's Pass, close to this ridge, in limestone, in the valley between No. 3 and No. 4.—Stairway ridge.

No. 4 Quartzite Ridge:
The third ridge from the *Cryptozoön* valley, south.—Mareenie Escarpment.

Post-Ordovician conglomerates and conglomeratic sandstone.

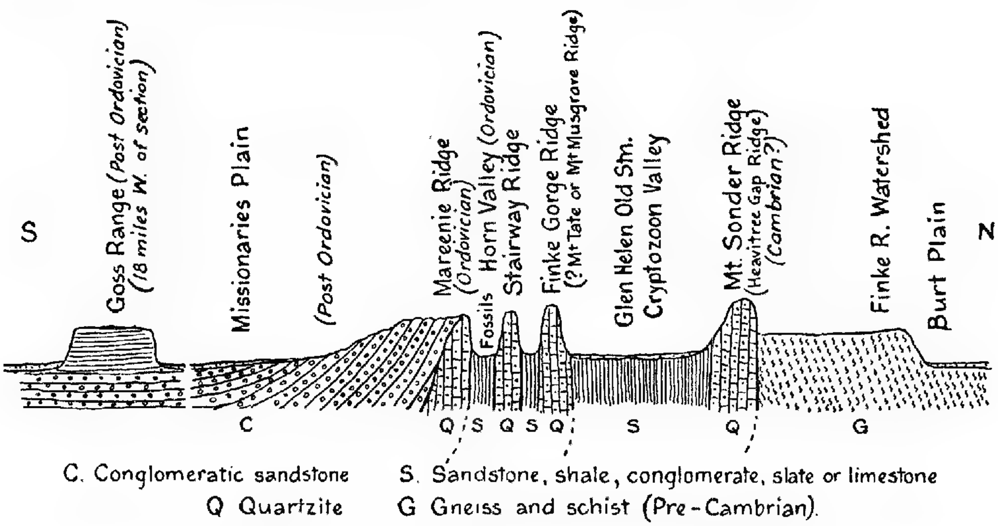


Fig. 1.

Finke Gorge Section, diagrammatic Section AB, about 30 miles.

Going north from the watershed of Stokes' Creek to Stokes' Pass the descent is rather steep, over Post-Ordovician ledges, until a valley of erosion is reached, the north side of which is determined by No. 4 quartzite ridge—No. 4 is the most southerly of four that constitute Stokes' Pass. The total width of exposed Post-Ordovician outcropping beds from Rudall's Creek to Stokes' Pass is seven to eight miles, and the total thickness must be great. The contact with the Ordovician beds is hidden by the alluvium of the valley floor situated immediately south of the pass.

Winnecke's map shows only three quartzite ridges in Stokes' Pass, but there are four. It also erroneously shows Mareenie Escarpment ridge as No. 3. The Horn Expedition discovered Ordovician fossils under the Mareenie Escarpment.

When passing through Stokes' Pass one is down in a deep trough-like depression and unable to see clearly to which ridge the hard rocky bars that cross the pass belong, but by leaving the pass and following the valley of erosion between Nos. 2 and 3 quartzite ridges right through the ranges to the Missionaries Plain, in a south-westerly direction, the connection is plainly seen. In 1891 the writer, when following this route, discovered Ordovician fossils in the limestone beds that underlie the Stairway Escarpment—The Stairway Escarpment is No. 3 quartzite ridge; the Mareenie Escarpment is No. 4 quartzite ridge. Nos. 3 and 4 quartzite ridges are therefore Ordovician.

Near where the writer obtained the fossils under Stairway Escarpment two creeks that take their rise in the valley join, and making north, plunge headlong down over a thick, intensely hard massive quartzite ridge outcrop into the valley below. This ridge follows the Mareenie and Stairway ridges around from the pass and appeared to underlie them conformably, but the quartzite bed is disturbed and harder than the Mareenie and Stairway ridges. This then is No. 2, or Mount Tate, quartzite ridge.

From this, and other points of vantage, may be seen still another quartzite ridge following this No. 2 one, on its northern side, with a valley between. This is No. 1, or Mount Musgrave, quartzite ridge. While Nos. 1 and 2 do not here stand high, and form conspicuous physical features, as do Nos. 3 and 4, they are quite as distinct; and farther west form formidable ranges.

From the Finke Gorge to the western end of Stairway ridge we are on sure ground, and have undoubted Ordovician strata running through the heart of the ranges, in a nearly straight east-west line, the beds being highly tilted, with dip to the south the whole way. From Stokes' Pass the Ordovician beds, as previously mentioned, gradually assume a flatter dip as the outcrops curve to the south-west, with a notable increase in height. Upon reaching the Missionaries Plain the beds appear to be cut off by an east-west fault (the downthrow side being the above plain), the ends of which now form two high bluffs that overlook the plain. The Mount Tate and Mount Musgrave ridges are not cut off by the fault, but run westerly for several miles further, forming at the same time the northern boundary of the Missionaries Plain. On account of their greatly disturbed state, and high degree of metamorphism, the writer, as previously mentioned, leans to the opinion that they may be of Cambrian (?) age.

This order of succession of the "ridges" was first noted by Ernest Giles in 1872, *vide* his Journal of Explorations under date September 12 and 15, 1872. His description of the disturbed state of the rocks of which Mount Musgrave consists is very graphic, and characteristic of that, and also of the Mount Tate ridge. The extreme metamorphic character of the quartzite is suggestive of having undergone greater changes than have been observed in any of the Ordovician ridges.

In Stokes' Pass the dip of the strata is steep to the south—60° and upwards from the horizontal. The total distance across the upturned edges coincides with the length of the pass, viz., two miles. The total thickness of the strata in the pass would be 10,000 feet or thereabouts. If to this be added the 7,000 to 10,000 feet of conglomeratic sandstone, Post-Ordovician sediments following on to the south, then it becomes evident that at least 17,000

to 20,000 feet of sediments is represented in the South MacDonnell Ranges at this place, of which one-third only may be Ordovician.

As regards the disparity in age between the Cambrian (?) and the Ordovician sediments: Nothing could be plainer than the evidence afforded by a comparison of Mareenie and Stairway ridges (which are Ordovician) and the western end of the Heavitree Gap ridge west of Mount Sonder [Cambrian (?)], of the great disparity between the two. The former being directly opposite the disturbed area, could not have done other than be affected to some extent had it been in existence at the time. We find, however, that the Ordovician beds present the greatest possible regularity. So free from deformation are they, and so free from metamorphism, that any number of fossils may be obtained, and in perfect condition, anywhere where the fossiliferous beds are not covered by alluvium. Not only opposite the disturbed area is this the case, but also for many miles on either side of it.

The Cambrians (?), on the other hand, are not only tremendously disturbed, but portions have been shifted far from the line of range; for instance, the quartzite remnant on Arumbera Creek, which is eight or ten miles long. The massive magnesian limestone, and its accompanying beds, that invariably back up the quartzite ridge on the southern side, are there first seen to be in contact with an outcrop of the schists, then inextricably intermixed with them, and, finally, the schists and gneiss wholly replace the limestone, etc., and a little farther on the quartzite ridge itself is seen to ride upon the gneiss and schists, then to turn to the north and there end, to again, doubtfully, appear as a remnant on Arumbera Creek.

Note on the accompanying Map.

In what follows no special mention seems called for regarding the Ordovician, other than defining its limitations. The trend of the two main Ordovician anticlinal folds that occur south of the MacDonnell Ranges may be traced on the accompanying map. They run approximately at right-angles to the dip of the strata, which is shown by arrows. The known fossiliferous localities are indicated, and the approximate boundaries of the formations, including some of the remnants of the Finke Series. It may prove interesting to note how the Post-Ordovician beds occupy the synclinal folds of the Ordovicians, and the way the fossil-bearing beds occur along and under the margins of the younger series. *Orthis leviensis* is characteristic of the uppermost fossil beds. The quartzite ridges mentioned in the text are shown clearly by dotted lines.

Sequence at Stokes' Pass.

Note.—A broken fragment of quartzite on the Arumbera Creek may represent the Heavitree Gap quartzite ridge. If so, the space between it and No. 1 quartzite ridge might be the *Cryptozoön* horizon.

Cambrian (?)

No. 1 Quartzite Ridge:

May represent Heavitree Gap ridge, which is Dr. Ward's lower quartzite. The break in Mount Sonder ridge at Razorback makes the uncertainty. If correct, the valley between Nos. 1 and 2 would be the *Cryptozoön* horizon. This is Mount Musgrave ridge of Giles.

No. 2 Quartzite Ridge:

May correspond with Mount Blatherskite ridge, which is Dr. Ward's middle quartzite. Also with the ridge next south of the Ellery's Creek waterhole ridge. Also with the Finke Gorge waterhole ridge. Between Nos. 2 and 3 (but close to No. 3) is Ordovician. This is Mount Tate ridge of Horn Expedition.

Ordovician

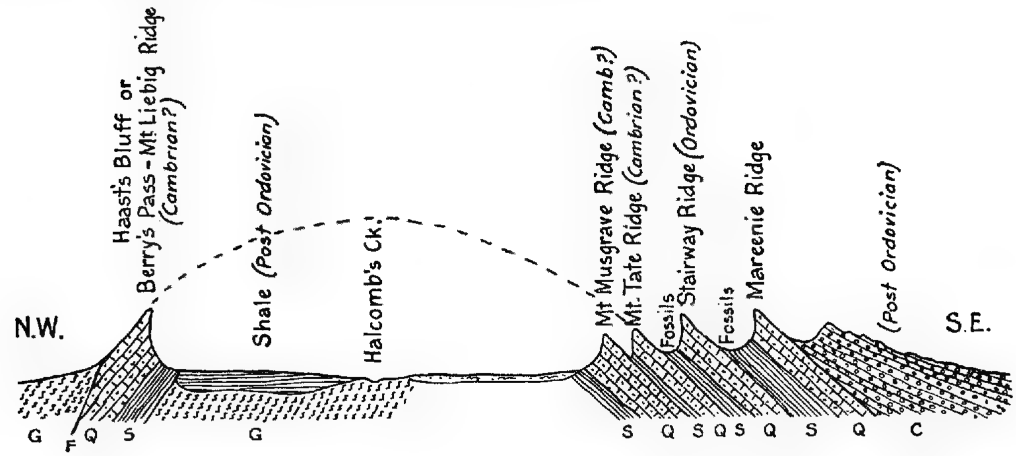
No. 3 Quartzite Ridge:

May correspond to Dr. Ward's upper quartzite. Between Nos. 3 and 4, close to No. 3, is Ordovician. This is Stairway ridge of Giles.

No. 4 Quartzite Ridge:

May lie beneath Emily Plain along Dr. Ward's section. This is Mareenie Escarpment of the Horn Expedition.

Post-Ordovician sandstone and conglomerate beds.



C. Conglomeratic sandstone S Sandstone, shale, conglomerate, slate or limestone

Q Quartzite G Gneiss and schist (Pre-Cambrian)

Fig 2.

Mareenie—Haast's Bluff Section, diagrammatic Section CD, about 32 miles.

The Pre-Cambrian Plateau and the Sediments Thereon.

To discuss the Pre-Cambrian complex in detail would require much greater knowledge of the component rocks than the writer possesses of them. In the first place the question of what is to be included and "what is to be excluded" has to be decided. Dr. Ward has raised the question as to whether such rocks as the gold-bearing quartzites should be included in this series. As the introduction of gold-bearing quartz and auriferous sulphides post-dated the major disturbances, that aspect, in the writer's opinion, cannot affect the question one way or the other. Nor does the high state of metamorphism the quartzites have attained. As a general rule, and over the whole complex, wherever bands of quartzites are seen to have been interfolded with the schists and gneisses they have been similarly altered. At the same time, where the same formation rides on the top of the schists, etc., only the beds that actually are, or have been, in contact are equally highly altered. Where conglomerates have been in contact quartzite conglomerate has resulted, and slates and shales became micaceous. There are rare occurrences of massive limestone beds in contact, and these have become crystalline.

Quite apart from debatable local occurrences, there is a noticeable absence of limestone in the Pre-Cambrian complex. There are large areas of granite—some quite unaffected by compression, and every stage from gneissic granite to true gneiss and schist is represented in endless variety. With the exception of Mount Hay and a few other smaller occurrences, Hornblende and other basic schist areas are not common. Nothing like the large areas of basic rocks in Western Australia has been noted there. Nevertheless, basic dykes are fairly plentiful in some areas, as also are acid dykes.

The later dykes have suffered little distortion. North-easterly from Bond Springs there are long runs of quartz and quartz schist outcropping that resemble quartz reefs when seen in the distance. They resemble the jasper outcrops of the Laverton District in Western Australia, but here are white. In the same locality large crystals of beryl occur, and much pegmatite. East of the Halleem Creek, standing a little out from the main range, north, are wall-like ridges of hard rock that may originally have been sandstone. They run so straight and for such long distances that, until examined closely, may be mistaken for discoloured quartz reefs. Similar bar-like structures cross the valleys in the range close by. They apparently represent sedimentary beds in the true Pre-Cambrian complex, as also do slaty outcrops on the south side of the Harry Creek, on the overland telegraph line. Other localities are equally convincing of sedimentary origin.

But the chief outstanding feature of the complex lies not so much in the immense area over which regional metamorphism obtains (that is simply enormous), but in the consistent east-west strike of the outcrops, and (local instances excepted) the constant steep dip to the north of the foliation planes of the gneisses and schists. Striking examples of this latter occur in many places, but two will suffice. Mount Zeil, the highest peak in the MacDonnell Ranges, is 4,786 feet high. Viewed from either east or west the crest is thin, like a wedge. The mount is wholly composed of gneiss. Viewed from the north, huge areas of bare rock, and very steeply inclined, reach practically from top to bottom. These smooth surfaces represent foliation planes. Again, the climb from the plain south of Mount Liebig to the watershed of Warren Creek is a good stiff one, over smooth-faced areas of highly-inclined schists. Looking east, when near the watershed, one sees, in Mount Palmer, a precipitous-sided block of red sandstone, nearly horizontally bedded, capping the ridge. The mount itself stands 1,550 feet above the surrounding country, and the red sandstone capping is 500 or 600 feet thick. The protection afforded by the capping to the upturned edges of the schists, with a creek undermining them far below, has exposed one of the finest examples of foliation the writer has seen; and at the same time of an unconformity on a grand and lucid scale.

The most typical gneiss and schist area within the great Pre-Cambrian complex extends from the latitude of Alice Springs to that of Ryan's Well, say 80 miles. North of that large areas are occupied by granite, to 20 miles north of Tennant's Creek telegraph station, say 350 miles from Alice Springs. The schist area extends in an east-west direction, from beyond Arltunga in the east to beyond Mount Udor in the west, the total length being 300 miles for certain, and probably 400. In all probability the total area occupied by Pre-Cambrian rocks in the Northern Territory, lying north of Alice Springs latitude, is not less than 150,000 square miles.

The quartzite ridges near the Finke watershed stand well above everything surrounding. To render possible the cutting down of the gaps through the ridges, the general level of the watershed, and probably the plateau as well, must have exceeded the present by 2,000 feet at least. The comparative uniformity of the level of the present watershed over large areas—say 1,000 feet below the highest portions of the ridges today—and the more or less uniform height of the tops of all the ranges to the south, would suggest that the whole region was peneplaned down to that level; the peneplanation coinciding with the sedimentation to which Gosse's Range, Middle Range, etc., owe their origin—probably Post-Ordovician.

But subsequent peneplanation, even to this latter, of the Pre-Cambrian plateau seems evident. Ten miles north of Alice Springs the southern edge of Burt Plain is to be seen. For 100 miles, almost due west, it finds its

southern limit in a steep wall-like face to a tableland that stands 800 feet, or thereabouts, above the level of the plain. This wall-like physical feature faces north and apparently is a product of undercutting by the ocean, aided by the foliation planes of weakness in the schists and gneisses of which the slope is composed. It is on the higher tableland the Finke River watershed is situated.

The Pre-Cambrians and Cambrians (?).

As the history of the Cambrians (?) is so closely associated with the tectonics of the Pre-Cambrians, it will be more convenient, and more explicit, to deal with the two conjointly.

Portions of the Pre-Cambrian area are covered by quartzites, shales, slates, conglomerate, etc.; the total thickness of such beds rarely exceeds a few hundred feet. As regards the age of these sediments, the only fossiliferous evidence we have consists of the discovery of Cambrian Trilobites of the genus *Agnostus* and genus *Microdiscus*, in buff-coloured mudstone, about 40 miles south-east of Elkeedra Station, Murchison Ranges.(3) The sediments in those ranges usually have a flattish dip, but are much disturbed. Quartz reefs occur in them, as well as in the Pre-Cambrians, on which they repose, and in all probability they were intruded by the numerous basic dykes in that area. Although the writer did not observe any certain case, he saw many instances where that evidently had taken place, and the sediments had subsequently been denuded.

The Foster Ranges, at Barrow Creek, occur in the same way as do the Murchison Ranges. That is to say, the Pre-Cambrians are capped by red shales below and quartzite on top over a considerable area, and these latter are seen to dip flat in different directions, and have been much disturbed. No fossils have yet been observed in these sediments, but in all probability they belong to the same formation as the Murchison Ranges. Midway between the two, viz., at the Taylor Crossing Well, are beds of quartzite and sandstone that form a more conspicuous range, the rocks of which dip (south) at a greater angle than in either of the two ranges just mentioned, and appear to have reached a greater stage of metamorphism, much of the range consisting of hard white quartzite, like the "White Range" at Arltunga, only that the rock strata dip in the opposite direction, and apparently were, to some extent, at any rate, faulted down into the Pre-Cambrians. Although occurring beyond the area under review, it may not be out of place to remark that the sediments forming the ranges about Attack Creek, and from there to Newcastle Waters, show great similarity to those occurring in the Murchison and Barrow Creek Ranges and, like them, lie flattish and are greatly disturbed. At Central Mount Stuart there is a greater thickness of shale than in the Foster Range, at Barrow Creek. At 40 miles, and again at 75 miles, north-west of Barrow Creek there are sandstone and quartzite ridges that lithologically resemble those of the Murchison and Barrow Creek Ranges; they dip flattish in different directions, and are seen to be as greatly disturbed as in those ranges. Mount Denison and Mount Leichhardt, situated some 50 miles west of Central Mount Stuart, are mentioned later on. The Buxton Range, on the Lander Creek, and other hills westerly from Central Mount Stuart, are capped with quartzite and sandstone. A few miles north-east of Tea Tree Well there are some low hills capped with sandstone, shale, and quartzite. These "capping" beds have low dips that are not constant; they appear to be outliers of the Foster Range. [Skirting the south side of the

(3) Contributions (Nos. 12 and 13) to the Palaeontology of South Australia, by R. Etheridge, jun., Govt. Paper, 1902.

Stirling Station swamp, runs an east-west bed of travertine limestone that appears to have a disconnected continuity for many miles in an easterly direction. It is of recent formation.]

Still coming south over the Pre-Cambrians, the next instance of sediments occurs at a spot some seven miles south of Ryan's Well, on the telegraph line. "Hann's Ridge," as it is called, is seen to be a quartzite and sandstone band of rock of perhaps 100 feet or 200 feet in thickness, reposing on a green-blue micaceous slate, probably of equal or greater thickness. These dip north at angles varying between 10° and 25° from the horizontal at this place, but much steeper elsewhere. The ridge strikes east and runs on for a few miles, and there it ends. Both south and north of the ridge are granite and granitic rocks, with small quartz veinlets intercalated. Two miles north of the ridge remnants of the slates appear on the surface for a short distance. In a westerly direction the ridge keeps on (in the form of dome-shaped, disconnected low hills as seen from north or south, but as a continuous ridge seen from east or west) for many miles, terminating in a hill that stands 1,300 feet above the plain, and known as "Central Mount Wedge." The ridge, as a whole, is known as "Stuart's Bluff Range."

Stuart's Bluff Range, or "ridge," is a remnant of quartzite that belonged to a sedimentary formation that apparently covered most, if not all, of the Pre-Cambrian area prior to the earth movements that produced the main orographical features in Central Australia, of which we now have only a few broken records. Subsequent to the great earth movements enormous quantities of rock—whole mountain chains—were removed from the Pre-Cambrian area. The earliest truncation of which we have definite record probably lowered the then mountain ranges to a base level of the highest peaks of the MacDonnell Ranges today. That is to say, the general level of the plateau was sufficiently high, *e.g.*, to throw the rainwaters over the top of the northern quartzite range at Ellery's Creek, Glen Ormiston, Redbank Gorge, Heavitree Gap, etc., The writer has not seen, in his somewhat extensive travels over the Pre-Cambrian plateau (nor has he met with any recorded evidence of), anything to suggest that more than one sedimentary formation —and that with more than one, or at most two, quartzite bands of any magnitude—was in existence when the earth movements that so disturbed the sediments occurred. This is characteristic of the Murchison, Foster, Reynolds, and other ranges, and of the remnants that "cap" so many isolated hills; also of the ridges faulted down into the Pre-Cambrian, as for instance in the remnants that now form the Stuart's Bluff Range (or "ridge"). These remarks apply equally well to the White Range at Arltunga, the Arltunga—Winnecke Bald Hill ridge, the Ellery's Creek north ridge, Haast's Bluff—Berry's Pass, and the Mount Liebig ridges, all of which are faulted down into the Pre-Cambrians. They also are equally applicable to the Mount Benstead -Heavitree Gap—Ellery's Creek waterhole—Mount Sonder ridge.

Still another feature must be emphasized. Without exception, these remnants all show shattering of the strata and considerable displacement, rapid changes in the dip occur, faults are common, and sometimes rapid change in the strike, *e.g.*, at Mount Razorback, at the head of the Finke, and at Central Mount Wedge. The strata in contact with the schists are more often than not highly altered and metamorphosed, *e.g.*, sandstone to quartzite, and slate and shale become micaceous. Where the quartzites are faulted down into the schists, etc., *e.g.*, at Taylor Crossing Well, 26 miles north of Barrow Creek, Stuart's Bluff Range, Mount Liebig, Berry's Pass, Ellery's Creek north ridge, White Range, Arltunga, and elsewhere, the quartzite in contact, or that once was in contact, with the schists is highly metamorphosed

and intensely hard, which gives these portions of the formation the appearance of being of greater age than where it did not contact. The north side of the quartzite at Haast's Bluff, Mount Liebig, and Central Mount Wedge has all been, if not now, in contact with the schists and looks older than the red sandstone escarpments on the south sides of those mountains. For such reasons the writer supposes H. Y. L. Brown coloured Stuart's Bluff Range Cambrian on his map, and Dr. Ward placed the ore-bearing quartzites of Arltunga in the (perhaps) uppermost of the Pre-Cambrian sediments in the MacDonnell Ranges. Tate and Watt also express doubts as to whether the North Quartzite Range and the accompanying slates at Ellery's Creek ought to be included in their Ordovician Series.[4] Their Gill's Pass Section (fig. 9) is incomplete, in so far as representing the complete sequence. Faulting and over-thrusting have apparently obliterated some of the beds at this place. In addition to being faulted down into the schists, they are seen to be interfolded with them, and over long distances to conform in strike and dip to the foliation stratification of the Pre-Cambrians, *e.g.*, the Haast's Bluff—Berry's Pass quartzite ridge is so interfolded for many miles, and likewise Ellery's Creek north ridge, and Stuart's Bluff Range. The Osborne Range, at Taylor's Crossing, also probably comes within the same category.

North of Tennant's Creek and the Murchison Ranges the Pre-Cambrians become covered with sedimentary formations of Palaeozoic age—perhaps Cambrian. South of the marginal line, the Pre-Cambrians are hidden from view over extensive areas by recent sandplains and, in the hollows, by comparatively recent sedimentary accumulations. Every here and there the Pre-Cambrians are seen in the banks of shallow watercourses, or on any rising ground, showing that that formation is present very close to, if not actually at, the surface, either in the form of schists, gneisses, or granite.

The Great Schist Area.

South of the Annas Reservoir line of ranges, and its western extension, the Treuer Range (in both of which granite and gneissic granite is largely represented), "The great schist area" finds its northern margin. Its southern limit is the Heavitree Gap quartzite ridge, near Alice Springs, with its eastern and western extensions. South of Arltunga the ridge is broken, but, apparently, is again in place at Ruby Gap. West of Alice Springs the Ellery's Creek waterhole ridge, and Mount Sonder ridge—which are one and the same with Heavitree Gap ridge—continue the line to Mount Razorback, where the Pre-Cambrians are seen to pass under the Mount Sonder ridge. Beyond Razorback the line runs along south of Mounts Crawford and Palmer, and probably is in the same position in regard to Mount Udor. From Mount Benstead to Mount Udor is about 250 miles. From Heavitree Gap ridge to Annas Reservoir, about 90 miles. As Mount Udor does not mark the western limit, nor Mount Benstead the eastern limit, the east-west demarcations are fixed for the sole purpose of excluding areas that may not conform exactly to what follows, viz.:—Over a length of 250 miles by 90 miles broad, the schists and gneiss foliation planes strike east-west, and dip steep to the north. There are, of course, local variations, but they do not alter the general rule.

This schist area, and its eastern and western extensions, apparently represent the site of the, one time, chief mountain chain in Central Australia. No quartzite ridges or cappings remain in and near the centre of this area; those that occur are near the margin, and it is quite certain that portions of them, at any rate, were deeply buried. Take the Mount Liebig one as an instance. The mount stands 2,050 feet above the surrounding country, by Gosse's

(4) Horn Expedition, p. 42, Geol. and Botany.

measurement. The northern half of the mount consists wholly of gneiss and schist, while the southern half is quartzite and sandstone, the dip in each case being the same, viz., approaching the vertical. The northern, or gneissic, half is the higher. The gneiss indicates clearly that originally both series stood much higher than they do today. As the quartzite, etc., is seen to still go underfoot, in all probability the depth of burial was originally not less than 3,000 feet—nearly vertical.

Five miles due south of the Mount Liebig quartzite ridge runs the Haast's Bluff—Berry's Pass quartzite ridge. The latter dips north, fairly steep, while the former, in places has a dip to the south, as much as 17° from the horizon. From the absence of gneiss and schist rocks between the two ridges, and their constant (universal) contact elsewhere, it is probable that the sedimentaries were here caught in a sharp synclinal fold, that gradually decreases in width going east, and widens going west. It is the only instance of the kind known to the writer over the whole area of the Pre-Cambrian Plateau.

The Buried Sediments and their Counterpart.

It may be as well here to indicate some of the occurrences of quartzite that were faulted down into the schists and gneiss, and were so compressed that they assume the aspect of being part and parcel of the schist and gneiss formation and, as suggested by Dr. Ward, qualified to be even classed as Upper Pre-Cambrian:—Osborne Range, Stuart's Bluff Range, Bald Hill—Winnecke—Arltunga Range (which includes the White Range at Arltunga), the North Quartzite Range at Ellery's Creek, Haast's Bluff—Berry's Pass Range, and the Mount Liebig Range. These so-called "ranges" are really comparatively narrow ridges of hard quartzite and sandstone that stand up prominently above the enclosing schist rocks and surrounding plains, the height of which varies between a few feet and up to 2,000 feet. The length varies from a few miles to 70 miles in the case of the Haast's Bluff—Berry's Pass ridge, and 120 miles, as a straight line, in Stuart's Bluff Range. Almost without exception these ridges show wonderful regularity as regards width, lithological similarity, strike, and dip throughout their entire lengths.

The sedimentary covering mantle to the schists, prior to being disturbed, must have been of comparatively uniform thickness, and the faulting of wonderful regularity along a given strike, otherwise the ridges would not follow such direct lines as they are seen to do. Had these ridges formed a part of the original complex, in the writer's opinion, such remarkable regularity would have been an absolute impossibility. It only could be possible by pleneplanation over the area, followed by regular sedimentation over the area, followed by regional and uniform compression of the whole area. In addition to folding the area into anticlines and synclines, faulting on a grand scale took place accompanied by overthrusting and shattering of the strata, in all of which the overlying sediments participated. If one may judge from the sedimentary remnants faulted down into the schists, and the, more or less, horizontally disposed remnants scattered over the surface of the Pre-Cambrian area—some of which are known to be of Cambrian age—there is nothing to indicate that the sediments covering the Pre-Cambrians when the first great movements occurred were of any great thickness. On the contrary, the evidence points in the opposite direction, for rarely do we find, as already stated, more than one strong band of quartzite in the remnants, whether buried or not.

Have we then any right, or reason, to conclude, because the folding was of sufficient intensity in some places to cause faulting and displacement, and even deep burial, of the sediment capping, while in others sufficient only to

shatter the strata and cause considerable disturbance generally, that the sediments in each case were of different geological ages? Does the circumstance of strata, while deeply buried, undergoing considerable metamorphism, even to the extent of impregnation by auriferous quartz and auriferous sulphides, necessarily place them in a different category? The writer's opinion is, that if the said sediments have lost their identity by becoming undistinguishable and inseparable from the enclosing rocks, they would then pass over to—in this case—the Pre-Cambrian group, but not until. If the extreme modes of occurrence and the extreme metamorphism that obtain in certain areas be discounted, there seems to be no reason why the whole of the remnants that have been referred to above should not be classed as Cambrian (?).

Lithologically, and structurally, the writer is not aware of any reason why the Murchison Range should not be classed (provisionally at any rate) with the Barrow Creek Ranges; and the latter with the ranges surrounding and south of Central Mount Stuart, Buxton Range, and Stuart's Bluff Range. Stuart's Bluff Range (or "ridge") almost for certain constitutes all that remains of the northern limb of an arch, the southern limb of which (all that remains of it) may be recognized in the Mount Liebig quartzite ridge. As already stated, the sediments appear to have been nipped in the schists in the form of a sharp synclinal between Mount Liebig and Berry's Pass. The Berry's Pass quartzite ridge dips north throughout its entire course. It extends westward from Berry's Pass in a series of "bluffs" (identical with the habit of Stuart's Bluff Range) for several miles; its eastern extension overlooks the Darwent Valley in the eastern of the three Haast's Bluffs, the total length being about 70 miles. From where the syncline (?) ends, viz., north of Mount Crawford, to its eastern end, the ridge is seen to be faulted down into the schists, with schist and gneiss on both sides. Originally, there is little doubt, it extended eastward across the valley of the Darwent, but great erosion has removed all traces beyond Haast's Bluff.

South of, and near, Haast's Bluff two or three smaller remnants of the same formation occur, capping schist hills; and again, on Arumbera Creek, north of Stokes' Pass, the same formation occurs as an isolated ridge of quartzite, standing on, or in, the schists. The Arumbera area is characterized by great disturbance, and the southern limit of this (?) Cambrian quartzite is, as yet, not positively determined, but the disturbed state of the two northern quartzite ridges of Stokes' Pass, that run west from the pass to Mounts Tate and Stirling, in comparison with the two Ordovician quartzite ridges that superimpose them, the writer thinks may, as previously stated, represent the southern limb of the arch, of which the Berry's Pass Haast's Bluff ridge would form the northern. F. R. George, in describing the western end of these ranges, states:—"They are composed wholly of quartzite almost horizontally bedded." *Vide* his Journal of March 14, p. 7, Govt. Printer, 1907. West of Mounts Tate and Stirling all traces of the southern limb are lost.

There is one other remnant of a sedimentary formation the connection of which is doubtful. Mount Thornton is a hill of no great height, nor conspicuous to any but a geologist. It is situated immediately on the north side of the Berry's Pass Haast's Bluff ridge, and lies north of Mount Crawford. The writer only saw the mount from a distance. Seen from the south, it appeared to be a horizontal capping to a portion of the above ridge (the strike of which is east-west, and the dip steep to north). From the north, the remnant was seen to cap a hill of schist, behind which the ridge was distinctly visible on both ends of the horizontal capping, but not quite so high. The capping appeared to be greatly disturbed, and probably is of Cambrian (?) age. As the remnant is situated somewhere near the eastern end

of the supposed synclinal fold, it may represent some portion of the Mount Liebig ridge. In any case, it is a most unusual occurrence and difficult to find a satisfactory explanation for. At first the writer tried to connect it with the Mount Crawford formation, but found that solution unsatisfactory.

Having indicated, in a somewhat cursory manner, the several sedimentary remnants that obtain from north to south over the Pre-Cambrian Plateau, and their mode of occurrence, and also, as the writer thinks, their geological age, it remains to correlate these with the sediments that occur along the southern margin of the plateau. No geologist, the writer thinks, familiar with the MacDonnell quartzites, and their mode of occurrence, would hesitate to class the Bald Hill—Winnecke—Arltunga quartzites, being practically a continuous ridge, as of the same age; and with them the Mount Giles—Mount Sonder—Haast's Bluff—Berry's Pass, and Mount Liebig quartzites. For the most part these quartzite ridges have steep dips, also vertical, and are backed up on both sides by schists (or gneiss), while in others they repose on the schists (or gneiss), but are backed up on the other side by massive crystalline limestone, and frequently by slates and shales as well. The Mount Sonder Range is a case in point, the limestone there being on the south side. If the range be followed to its western end the limestone will be found wanting, and the quartzite seen to stand *on* the gneiss. The range (or ridge) is, as seen in Mount Sonder, the southern limb of an arch. By following the ridge along east to the well-known Ellery's Creek waterhole, the northern limb may be seen in the Ellery's Creek north ridge, six miles away. Tate and Watt, presumably because the north ridge was faulted down into the schists and appearing to be more highly metamorphosed, hesitated to accept the two as of the same formation. Had they followed both ridges westward to where they come together, doubtless they would have been convinced. Had the limestone been found on the north side of the north ridge, there would have been no way out of their dilemma but to accept. That is to say: The several ridges of quartzite, etc., that are faulted down into the schists, or that impinge on the gneiss and schists between Mounts Sonder and Arltunga, belong to one formation. We will take a case in point. As is well known, the Mount Sonder quartzite ridge impinges on the schists and gneiss on its northern side, and on the southern side it is backed up by massive magnesian limestone. The ridge has undergone considerable shattering, bending, faulting, and displacement here and there throughout its lengthy course, and south of Arltunga even a short gap or two may be noticeable, but further on it resumes its course to beyond the writer's travels. Throughout its total length (probably more than 200 miles) the limestones back the ridge up on the south side, while it impinges on the schist and gneiss on the north side. It approaches near to, or may even stand over, the vertical in places, but its normal dip is steep to the south. The ridge, together with the accompanying limestone, shale, and slaty beds, owe their present disposition and disturbed condition to long-continued, regional pressure. Prior to the Ordovician sedimentation the catastrophic nature of the earth movements, as compared with those occurring later, are quite evident from the more disturbed state of the remnants—which include this (?) Cambrian formation. It was during these disturbances that the Bald Hill—Winnecke—Arltunga—White Range ridge was faulted down into the schists. This ridge is comparable in many ways with the Berry's Pass—Haast's Bluff and the North Ellery's Creek ridges; its strike is east-west; its dip is steep, to the north, and is enclosed on both sides by schist (or gneiss) and, like them, conforms in a general way to the strike and dip of the foliation planes of the schists. On the western side of Bald Hill, where the ridge ends,

the quartzite ridge is seen to stand *on* the schists, in the same way as does the Mount Sonder ridge where it ends in Mount Razorback. These, and many other instances (that could be mentioned), show clearly enough that the ridges that occur *in* the schists are simply faulted-down remnants of a sedimentary formation that originally covered the schists. This ridge is interesting for two reasons. The first is because auriferous quartz and auriferous sulphides occur in it, both at Winnecke and at White Range. The second lies in the fact that remnants of the magnesian limestone that accompany the Heavitree Gap—Mount Sonder ridge occur on the north side of the Winnecke ridge, and evidently were faulted down into the schist, together with the quartzite. About three miles along the bridle track leading from Winnecke to Arltunga the limestone may be seen.

Dr. Ward has suggested that the auriferous White Range quartzite may represent the uppermost of the Pre-Cambrian sediments.(5) The writer places them with the Heavitree Gap quartzite, which Dr. Ward and Tate and Watt regard as Ordovician, and H. Y. L. Brown and the writer as (?) Cambrian. Whatever the age of the Heavitree Gap quartzite eventually turns out to be, the writer is convinced that the ridges that are faulted down into the schists are the same.

The writer stated (6):—"In all probability many of the quartzite and shale cappings of the granitic hills, scattered over the plateau, north . . . of the MacDonnells are Ordovician." Subsequent observations make him doubt the accuracy of that surmise, excepting perhaps near the margin.

The Post-Ordovician Conglomerate Beds.

A few miles east of Temple Bar Well, in the Temple Bar Creek, there are some well-known waterholes, washed out of conglomerate rocks. These excavations are in the above formation. Evidently these beds extend still farther easterly, in the Emily Plain, but the writer has not seen them. From these waterholes to the western end of Mareenie Escarpment is 150 miles. Between these points the formation appears to be continuous, and it here occupies the most northerly of the synclines in the sedimentary series. The northern edge of the formation, from a point several miles east of Ellery's Creek to Stokes' Pass, runs through the heart of the South MacDonnell Ranges. Away from the hills, on the Emily Plain, the conglomerate is not visible, but the evidence of Temple Bar Well, which was sunk in the formation, and the above waterholes, proves conclusively that it is there. It forms the southern slope of the ranges from west, or a little south of west, of the Alice Springs racecourse to Mareenie Bluff. South of Temple Bar Well, along the overland telegraph line, the formation is recognizable in stony outcrops of ridges on both the northern and southern slopes of the Ooraminna Range. It probably occupies much of the second syncline south of Alice Springs, for in addition to the positive evidence afforded by the Indembo Well (which was sunk to 200 feet, wholly in this formation) and the length of outcrop there, the sandhills for some distance south of Indembo Well are studded with pebbles and grow clumps of mallee, a variety that may be seen wherever this formation either outcrops or lies near the surface. The conglomerate of this formation is frequently cemented with carbonate of lime, that on weathering produces sand and soil rich in lime, which this variety of *Eucalyptus* appears to appreciate. West of the telegraph line the southern limit of the conglomerate is not known, but it may be seen in the bed of Ellery's Creek at

(5) *Vide* page 79.

(6) Notes on Stratigraphy, Central Australia, Trans. Roy. Soc. S. Austr., vol. xxxviii., 1914, p.49.

Parke's old Ellery's Creek Station, the site of which is near the northern face of the James Ranges.

At Gilbert Spring, and in other places west of Hermansburg Mission Station, are outcrops that suggest the presence of this formation to within, say, 15 miles east of Pine Point, where the massive sandstone changes over to the flagstone variety so characteristic of the Ordovicians. The syncline between the Krichauff Range and the South MacDonnell Ranges here appears to be wholly occupied by conglomeratic sandstone, the upper portion of which, as seen in Gosse Range, is "Massive Sandstone."

The western limit of the formation in this syncline appears to be in the neighbourhood of the watershed of Carmichael Creek. In the preceding section Mareenie ridge was referred to. We must return to it to get a clear idea of how the formation ends. Going west from Stokes' Pass the dip of the Ordovician beds grows flatter, bending gradually, like the mouldboard of a plough, and the Mareenie and Stairway ridges increase in height as they curve their way more and more to the south from Stokes' Pass, eventually terminating in two precipitous bluffs, each considerably more than 1,000 feet high, that overlook the Missionary Plain. The effects produced by the erosion of beds thus disposed and elevated has resulted in two very remarkable escarpments, each 15 miles to 20 miles long, that face north-west and are precipitous for 300 feet, 400 feet, and 500 feet from the crest, with a talus slope of equal height below. The Ordovician limestone beds below the scarps are richly fossiliferous, but fossil-collecting under those precipices is somewhat nerve-racking, for avalanches of rock may fall at any time, but the rugged scenery is grand. *Vide* Ernest Giles' Explorations of September 12, 1872.

In Ellery's Creek Gorge, in the Finke River Gorge, and on the saddle between the head of Rudall's Creek and Stokes' Pass, the conglomeratic sandstone is seen to compose about half (the southern half) of the South MacDonnell Ranges. The remarkable bending and elevating of the Ordovicians, just described, forms a veritable cul-de-sac, a dead end, so far as the conglomerate beds are concerned. The Mareenie (Ordovician) ridge has a gentle slope from the crest, in a south-easterly direction, right down to the watershed of Carmichael, Stokes', and Rudall's Creeks, all of which occur on the conglomerate sandstone. The actual contact between the Post-Ordovician and Ordovician beds is on the southern slope of Mareenie ridge, which line of contact must gradually curve to the south-west, as does the Mareenie ridge. What becomes of the conglomerate beds beyond the east-west strike fault that so suddenly cuts off the Mareenie and Stairway ridges is still undetermined. That conglomerate extends to Mareenie Bluff is all that is known. On the opposite side of the valley, to the south, is Gardiner's Range, which is Ordovician

Probable Counterpart of the Post-Ordovician Conglomerate Beds.

At Hermansburg the red sandstones of the Krichauff Range are massive, and in places, as noted by all observers, contain bands of pebbles. Both here, and where Ellery's Creek enters the range, the massive sandstone beds are seen to undulate, but there is a notable absence of the "flaggy" features so characteristic, but not universally so, of the Ordovicians. These features persist going south, past Palm Creek, to where the sandstone beds assume a more flaggy nature and take on a very decided dip to the north, which introduces the Gardiner's Range anticline, the trend of which from Boggy Hole to opposite Mareenie Bluff is north-westerly. The Missionary, or Palm Creek, sandstones repose on, and cover, the Ordovicians from near Boggy Hole to near Gilbert Springs, but the southern limit along this stretch has not yet been

determined. There is no very great thickness of strata between the *Orthis leviensis* horizon and the base of the Post-Ordovician, as may be seen at Finke Gorge, Goyder's Pass, Stokes' Pass, and Mareenie Bluff. No fossils, other than those discovered by Tate and Watt in Ellery's Creek Gorge, have been observed to date in the Post-Ordovicians, and none have yet been found in the massive, or Palm Creek, sandstone beds, which apparently represent the southerly extension of the conglomerate beds.

It would be a strange coincidence if a formation 150 miles long and 7,000 to 10,000 feet thick over more than half its length should be confined to the one syncline. The writer has always held that the remnants of a formation, of which George Gill's and Levi's Ranges, and Middle Range (not the Middle Range of Tate and Watt's, No. 7 Section, which is Ordovician), lying west and south of Temple Downs Station, may be taken as examples, in all probability are younger than Ordovician. Tate and Watt's, No. 7 Section, shows exactly the relationship Levi's Range beds present in regard to the Ordovicians, when viewed in perspective, from either east or west "along the valley of a syncline." Tate and Watt failed to find any unconformity between these and the Ordovician beds, but their section is most convincing against their conclusion, viz., that they are Ordovician. The position of these beds is shown on the accompanying map. In the above-mentioned ranges this formation possesses uniform characteristics, viz., the upper two-thirds is composed of sandstone, the surface of which is indurated sandstone or quartzite (a purely local effect, but one that has largely been the cause of the preservation of these remnants). The lower one-third is composed of red shale, or perhaps, more correctly, "mudstone." The former has the habit of weathering into precipitous walls of rock, while the latter weathers into bastions or amphitheatre-like pictures.

Mounts Crawford and Palmer Remnants.

In travelling westward over the watershed of Halcomb's Creek, on the south side of Haast's Bluff, the writer noted the occurrence of a horizontally-disposed bed of red shale, reposing on the upturned edges of gneiss. When the watershed was reached the red shale formation became covered with sand, and was not again seen until nearing Mount Crawford. Mount Crawford is the most easterly of a line of flat-topped, often precipitous, but sometimes steep-sided, disconnected hills, that extend in a westerly direction to Mount Udor. These hills are remnants of a, one time, widespread formation of Palaeozoic age. It is singular in that it has no ties—nothing to connect it with either the Ordovician or Post-Ordovician systems, except, perhaps, lithological similarity, in which case it accords better with the latter than the former. Gosse found that at one place the beds of Mount Palmer had a dip of 15° to the north. Viewed from the west, however, very little dip was noticeable, and Mount Crawford had a similar appearance. On the north side of Mount Palmer the basal bed (which reposes uncomformably on the upturned edges of the schists) is composed of coarse conglomerate, followed by shale, upon which is a great thickness of sandstone, both of which latter appeared to be conglomeratic in places. Judging by the large quantities of loose boulders and pebbles around these hills conglomerate is plentiful in the formation. Gosse made the height of Mount Palmer to be 1,550 feet above the surrounding country. Mount Crawford is not as high as Mount Palmer. Between the two is a valley of erosion, in the middle of which stands Blanche Tower. Blanche Tower is a singular and very remarkable remnant. It is composed of a large block of shale, sandstone, and conglomerate perched on a cone-shaped pedestal of schist. The block of shale, etc., viewed from certain

standpoints, resembles the shape of a huge bell, and its appearance is singular and striking. In matter of size it dwarfs Chamber's Pillar into insignificance. The shale capping is a remnant of the bed of shale seen in both Mounts Palmer and Crawford, and that apparently is, more or less, continuous under the sandplains, eastward, all the way to Halcombe's Creek. About seven miles north-north-east of Mount Udor there is a remnant of a red or purple shale formation, and one portion of it is a hill in which the strata are seen to be rolled up like a scroll. The writer regards the occurrence as an outlier of the Crawford—Palmer formation, from which the sandstone, or upper portion, has been denuded. He was not near enough to Mounts Peculiar and Udor to verify the opinion, but seeing that their physical features and mode of occurrence closely resemble those mountains, in a region devoid of other hills, he has no doubt they belong to the same formation. The Mount Liebig and the Berry's Pass—Haast's Bluff quartzite ridges conform to the general strike and dip of the foliation planes of the schists, viz., "strike east-west," "dip steep to north." The Crawford—Palmer beds, lying near the horizontal, are therefore uncomformable to both the (?) Cambrians and Pre-Cambrians, both series having suffered great erosion and denudation prior to the Crawford—Palmer sedimentation. The order of arrangement of the component beds are identical with the Post-Ordovician beds as seen on the Walker River, west and north-west of the Parkes' Creek Junction. The physical features and habit of weathering are very similar also to that part, and also to Gosse's Range, on Rudall's Creek. (There is every reason to believe that Gosse's Range represents the upper beds of the Post-Ordovician System.) The fact of existing only in the form of a few isolated mountains leaves no doubt as regards the antiquity of the formation, but there is additional evidence in that Mount Palmer and the other remnants to the west stand now on the north-south watershed of that region. If the level of the basal beds be prolonged north, in imagination, it becomes evident that the great schist plateau on which these sediments were laid down, has also been denuded upwards of 1,000 feet. However, in comparison with the Berry's Pass and Mount Liebig quartzite ridges sedimentation, the Crawford—Palmer sedimentation was "comparatively young." It is tentatively placed in the Post-Ordovician division.

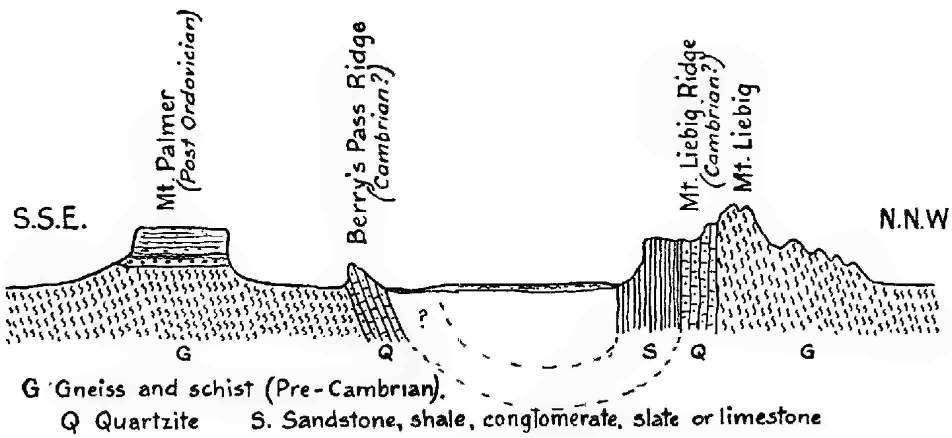


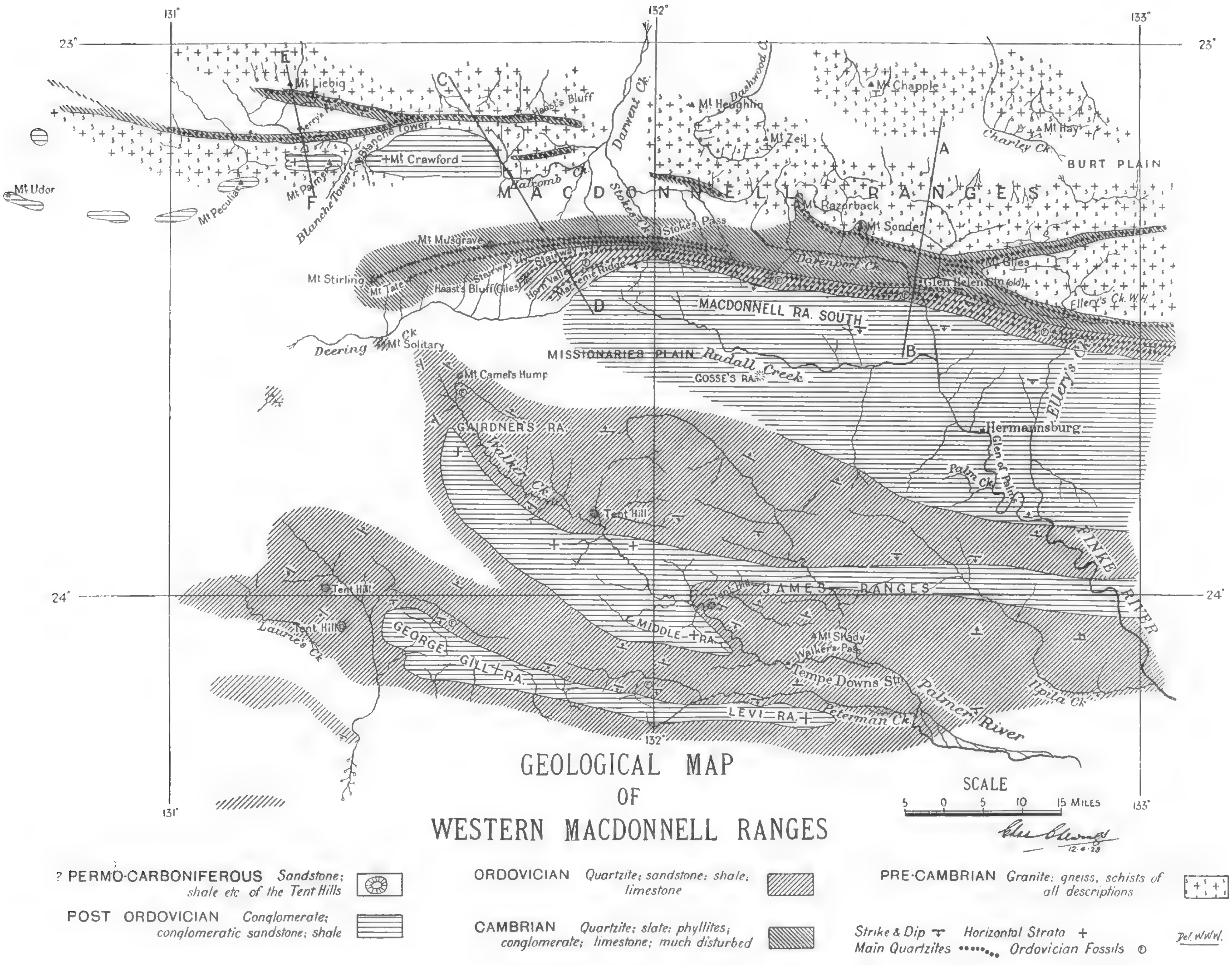
Fig 3.

Mount Palmer—Mount Liebig Section, diagrammatic Section EF, about 18 miles.

Notable Conglomerates and the Lander Depression.

There are three notable occurrences of conglomerates in Central Australia. (1) The best known is the Post-Ordovician conglomeratic sandstone and conglomerate formation of the South MacDonnell Ranges. (2) The Ayers' Rock, Mount Olga, Mount Currie line of conglomerate hills, being more inaccessible, is not quite so well-known but has been frequently visited. With the exception of the Mount Currie portion of the latter, both were visited by one of the geologists of the Horn Expedition, who noted a tendency towards foliation planes in Ayers' Rock, which monolith appears to be largely composed of metamorphosed arkose sandstone, but whether metamorphosed by regional metamorphism (i.e., as an included unit in a gneiss or schist area), or from some other cause, is not known. If Watt's "foliation supposition" be correct, then the Ayers' Rock line was in existence when the Cambrians were interfolded with the schists. On the other hand, the fact that the conglomerate of which Mount Olga consists contains granite, schist, quartz porphyry, lamprophyre, amphibolite, melaphyre, and fragments of quartz and felspar, shows that erosion had reached a stage when the Pre-Cambrians supplied a large portion of this conglomerate formation, which might bring its age into line with the Post-Ordovician conglomerate of the South MacDonnell Ranges. (3) The third occurrence is situated in a remote region that has seldom been visited, viz., about 50 miles west of Central Mount Stuart, from the top of which mount the high range, of which the conglomerate forms a part, can be plainly seen. Judging from its position, the range would appear to have originally been formed from the waste of the great central Pre-Cambrian Plateau, and such sediments as reposed thereon at that time. Whether the slope on which the formation now stands coincides with the ancient slope is not known for certain, but in all probability the large, low-lying hollow into which the Lander now pours its immense flood-waters has persisted, like the valley of the Finke, through the ages. In journeying from Barrow Creek to Victoria River, the writer crossed the hollow and found its surface to be one of the worst sandhill areas in Australia. The one redeeming feature, along the writer's route, lies in the remarkably shallow depth, good, fresh water, apparently in any quantity, may be had by boring or sinking, but it is a desert all the same. The hollow is now nearly full; the surface has no hills or prominent physical features, nothing to break the monotony of the long shallow undulations, which average about fourteen miles across. It is bounded on the west-north-west by the Tanami Ranges, and on the north-west by an extensive red shale and sandstone formation that occurs in gentle folds all through the Winnecke Creek region, and probably extends to the Victoria River. At the Mucka Cattle Station, and from there to the south-eastern bend of the Victoria River, basalt is much in evidence, and it extends for several miles east of Catfish Yard. This appears to be about the southern limit of that rock in the Victoria River district. On the overland telegraph line, basalt occurs in a similar rock formation (lithologically and tectonically) two or three miles south of Renner Springs, the two occurrences being roughly on the same degree of latitude. It is possible that prior to the basaltic epoch the Lander Basin, or hollow, had an outlet to the sea in what is now Cambridge Gulf.

The range in which the conglomerate occurs is remarkable, in that the range and one or two of the mountains in it have (like Mount Olga) resisted denudation, and now form the highest and most conspicuous physical features of all that region. The "Plateau" that supplied the material to build up the range, and on whose northern slope the formation reposes, is now much lower than the range. The high peak, at its western end (Mount Deni-


GEOLOGICAL MAP
OF
WESTERN MACDONNELL RANGES
131°
132°
133°
23°
24°
MACDONNELL RANGES
MACDONNELL RA. SOUTH
MISSIONARIES PLAIN
BURT PLAIN
Mt Liebig
Mt Chapple
Mt Heughlin
Mt Zeil
Mt Hay
Haast's Bluff
Blanche Tower
Mt Crawford
Mt Udor
Mt Peculiar
Mt Palmer
Mt Razorback
Mt Sonder
Mt Giles
Mt Musgrave
Mt Stirling
Mt Tate
Haast's Bluff (Giles)
Stokes Pass
Glen Helen Stn (old)
Mt Solitary
Mt Camel's Hump
GAIRDNER'S RA.
GOSSE'S RA.
Hermannsburg
Glen of Palms
Palm Ck.
Tent Hill
JAMES RANGES
MIDDLE RA.
GEORGE GILL RA.
LEVI RA.
Mt Shady
Walker's Pass
Tempe Downs Stn
Darwent Ck.
Dashwood Ck.
Charley Ck.
Halcomb Ck.
Stokes Ck.
Davenport Ck.
Ellery's Ck. W.H.
Ellery's Ck.
Deering Ck.
Radall Creek
Walker Ck.
Laurie's Ck.
Peterman Ck.
Palmer River
Ilpila Ck.
FINKE RIVER
SCALE
5 0 5 10 15 MILES
12.4.28
? PERMO-CARBONIFEROUS Sandstone; shale etc of the Tent Hills
POST ORDOVICIAN Conglomerate; conglomeratic sandstone; shale
ORDOVICIAN Quartzite; sandstone; shale; limestone
CAMBRIAN Quartzite; slate; phyllites; conglomerate; limestone; much disturbed
PRE-CAMBRIAN Granite; gneiss, schists of all descriptions
Strike & Dip
Horizontal Strata
Main Quartzites
Ordovician Fossils
Del. W.W.W.

son), was so conspicuous from Central Mount Stuart, that John McDouall Stuart, its discoverer, was induced to travel fifty miles to see it. The range runs east-west. Stuart, when camped near Mount Denison, sent Kekwick (one of his men) to Mount Leichhardt (a high peak and a remarkable hill in the range) to find water, and the following entries in Stuart's Journal are practically all we know of the formation:—Kekwick found "water springing out of conglomerate rock, much resembling marble—Mount Leichhardt and the range are composed, at their base, of a soft conglomerate rock in immense masses, heaped one on the other; the higher parts where the spring appears is of the same conglomerate, but broad and solid, having smooth face, which makes the ascent very difficult." This entry is on April 27, 1860. On the 28th he writes, having in the meantime ascended Mount Denison:—"This is certainly the highest mountain I have yet ascended. The highest mountain that I have seen in Central Australia. It took three hours to ascend and two hours to descend." On the 29th he states:—"Mount Denison and the surrounding hills are composed of a hard, reddish-brown sandstone. About 100 yards from the summit is a course of conglomerate, composed of stones from half-an-inch to four inches in diameter, having the appearance of being rounded at a former period by water. From the foot to the top of this course is about 10 feet, and the breadth of the top (presumably a ledge) is about 12 feet. There is red sandstone on the summit."

The writer has not been to the range, but has spoken with those who have been there, and they all agree that there is much conglomerate there and that the springs issue from conglomerate.

When travelling from Barrow Creek to Victoria River, Mount Denison was frequently seen from a distance—60 to 80 miles. Gosse also, seeing Mount Leichhardt Range from a distance, described it as a "very high range." Unfortunately, no trained geologist has visited the locality.

THE STURTIAN TILLITE AND ASSOCIATED BEDS ON THE WESTERN SCARPS OF THE SOUTHERN FLINDERS RANGES.

By Professor Walter Howchin, F.G.S.

[Read May 10, 1928.]

The Flinders Ranges can be naturally divided into a northern and a southern group. The northern Flinders, which is the more extensive group, takes the form, roughly, of an isosceles triangle with its base on the northern side and apex to the southward. The southerly limits of this group can be drawn between Hawker and Hookina, parallel with the southern end of Lake Torrens, where the range is restricted to a neck about 10 miles in width. From this point the ranges, in a reduced width, continue southward to Crystal Brook, and form the southern Flinders.

The western boundary of the Flinders Ranges is marked by a bold and often precipitous scarp, which defines the contour of the great rift valley on its eastern side.

There is a general similarity in the geological features of the southern Flinders. The beds rise as high in the geological scale as the lower stages of the Purple Slates Series (with Archaeocyathinae beds at Kanyaka and Wilson on the eastern side of the ranges), and go down to the upper members of the Adelaide Series as low as the subglacial quartzites and slates.

The Sturtian, or Older Tillite, has been observed by the writer along the western scarp of the ranges in the following localities:—1, Depôt Creek; 2, Mundallio Creek; 3, Spear Creek; 4, Baroota Creek; 5, Mount Remarkable; 6, the Gorge Road; 7, Crystal Brook.

1. DEPOT CREEK.

(Observations made in May, 1920.)

The Depôt Creek takes its rise in a low watershed about eight miles to the northward of Quorn, in the Hundred of Yarrah, and flows first north-westward, and then westward, till lost in the alluvial plains to the northward of Port Augusta. It is reached by following the main north road from Quorn.

THE PURPLE SLATE SERIES.

A prominent range, showing an almost level sky-line (fig. 1), lies to the westward of Quorn, having the Devil's Peak at its southern end and the Dutchman's Stern at its northern extremity, covering a distance of four miles. The range owes its prominence to a thick bed of light-coloured, siliceous quartzite, that forms its uppermost layers and is very resistant to the weather.

Pichi Richi Pass and Devil's Peak.

The Pichi Richi Pass supplies a section of the range at its southern end as the Dutchman's Stern does at its northern. The road from Quorn follows the western side of the railway to "Summit" and along the head waters of the Pinkerton Creek, which flows to the eastward, and the Saltia Creek that flows to the westward. The pass caused by these two creeks makes a very accessible way across the range. Although the grades are moderately steep there has been much alluviation of the valleys, probably laid down at a time of lower grade. The soil is formed chiefly from the weathering of the purple slates, mixed with harder

material from thin beds of quartzite that are interbedded with the slates. The setting free of these stones makes a very stony surface. The valleys are well grassed.

Purple slates are seen in section in a railway cutting, 241¾-mile post from Adelaide. [Dip W. 25° S. at 35°.] The cutting is nearly due west of the Devil's Peak. At a quarter-mile more to the southward another cutting shows the same beds with a dip due W. at 54°.

Crossing over to the road, near the above spot, a grey and pinkish dolomitic limestone, that weathers to a buff colour, is seen to outcrop on the eastern side of the road. The bed strikes N. 20° E., with a dip at 90°, and a width of 15½ feet. The beds show a tendency to dip westerly, are underlain by purple slates and overlain by thick quartzites. The limestone was traced for over a quarter mile in a north-easterly direction, where it showed a lower angle of dip and a spread of 18 yards. It crosses the road at the latter point, where it has a dip of 25°, is much disturbed, and is cut off at its northern end by the purple slates.

Going easterly, thick quartzites put on, and are followed, in ascending order, by purple slates alternating with quartzites forming the foot hills at the base of the Peak on its northern side. Purple slates here show a dip E. 40° S. at 48°. Cleavage planes cause the rock to break up easily. The direction of dip carries the beds under the main quartzite of the Peak. In the last valley passed before rising to the Peak there is another outcrop of the buff-coloured dolomitic limestone, with a width of five yards. This is so much like the dolomitic limestone on the road previously mentioned, further to the west, that it may be the same brought in by way of repetition in a strike fault.

The Devil's Peak is a remarkable feature in the landscape. It is a wedge-shaped pinnacle of light-coloured, fine-grained, saccharine-textured quartzite, very characteristic of the Cambrian quartzites. It has a steep, craggy face on both sides of the ridge. On the eastern side it shows the basset face of the beds, and, on the western, it has a dip slope to the westward, which, as being directed downwards to the valley, the beds are unstable, readily slipping by gravitation, are shed downwards, forming an exceedingly rough scarp. As the dip of the top quartzite is opposed to that of the beds to the westward it is probable that a fault intervenes.

The main quartzite is estimated to be about 800 feet in thickness. The stone has been much fractured by tectonic movements, slickensides are common, and these are usually faced by a layer of pure white, polished, and striated quartz; the latter appears to have been developed by pressure operating on the fine-grained quartzite.

Another remarkable feature present in this bed is a flaking, accompanied with a spherical exfoliation of the quartzite. Many of the pebble-like stones on the slopes are not waterworn, but rounded by spheroidal flaking. The same effects have been noticed to occur with other fine-grained siliceous rocks where the bed has been subjected to great tangential pressure, especially in the Cambrian of the Flinders Ranges. It is a form of conchoidal fracture caused by natural agencies in a suitable rock under pressure.

On the western side of the pass there are scarp faces opposite to the Devil's Peak that have many features in common with the latter—high mural cliffs that are topped by scarp faces of the white siliceous quartzite.

The Dutchman's Stern.

The main north road from Quorn follows the eastern side of the Devil's Peak range which terminates abruptly at about four miles from Quorn in a conspicuous rounded scarp, marked on the map as "The Dutchman's Stern." This physical feature has probably obtained its name from the resemblance it

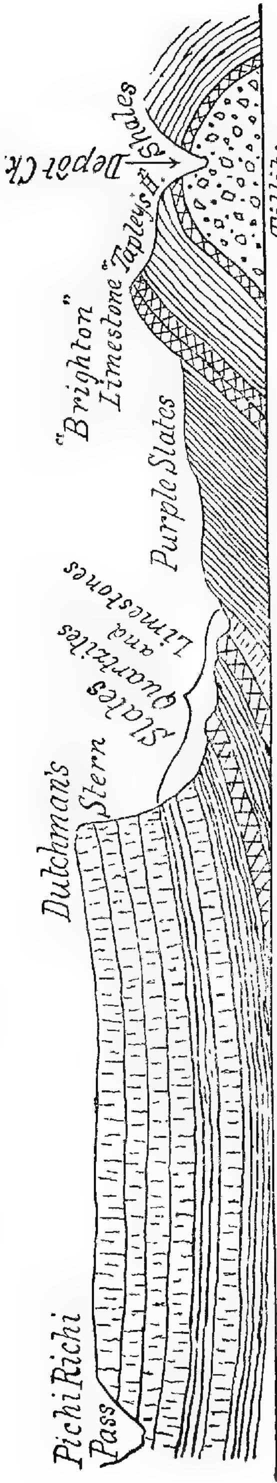


Fig. 1. Sketch Section from Pichi Richi Pass to Depôt Creek taken obliquely to the strike. Eight miles.

bears to the rounded stern of the old-fashioned Dutch sailing boats that were known as Dutch "billy-boys."

The scarp lies about two miles to the westward of the main road, and access was obtained by way of the old lime-kiln marked on the map in Section 547, Hundred of Pichi Richi. The lime produced at the kiln was made from a surface travertine that forms on the top of a buff-coloured limestone, to be referred to presently. The limestone at this spot showed a strike S. 15° E.

The Dutchman's Stern, in its essential geological features, is a scarp very similar to the Devil's Peak. Its upper portion consists of quartzite, that is probably 250 feet in thickness. This is underlain by purple slates and bands of quartzites, the waste from which is thickly strewn over the lower ground. Several small screes descend from the upper quartzite, but these are held up by terraces along the face. The height of the scarp cannot be much less than that of the Devil's Peak. The base of the "stern" forms a semi-circle that is about two miles in its curvature. The general dip at the face is a little south of east. At a short distance behind the terminal scarp there is a marked fracture of the quartzite cap with a sharp and steep down-throw to the north-east.

A very persistent feature near the base of the scarp and on the adjoining flat is the presence of a pinkish and whitish limestone that weathers to a buff colour, closely resembling the limestone, described above, as occurring at the back of the Devil's Peak in the Pichi Richi Pass. There is a considerable exposure of this limestone at some distance from the base at its north-eastern angle, showing a strike S. 20° E. A little further to the westward it occurs in strong features on the right bank of the creek that drains the northern side of the range. The limestone then approaches near to the base of the scarp, and at about the centre of the scarp-face it makes a very conspicuous ridge. The limestone curves round the base of the hill and can be traced for a considerable distance along its western side on the flat. The creek that drains the northern end of the range is very rocky, strong quartzites line the sides and form extensive dip slopes forming the bottom of the creek bed, causing a succession of vertical waterfalls of a picturesque kind. These quartzites dip E. 20° S. at 15°.

The view obtained on the western side of the range is very fine. Lofty mountains of purple slate, which, from their friability, produce no vegetation, their naked slopes and dark colour give a weird blackness to the scene, which in the case of the deep and narrow gorges looks like entrances to the nether

regions. One large-peaked and isolated mountain had been, apparently, split into two segments; in the one half the beds are pitched down vertically, while in the other the same beds are almost level. In a cleft made in this group of mountains a view is obtained of the illimitable plains that stretch away to the westward, including a view of the North Tent Hill, which appeared like a stupendous table set down in the midst of the plains.

The north road follows, in a general sense, the strike of the beds. The purple slates that rise from beneath the thick quartzites of the Dutchman's Stern continue in a northerly direction, through relatively low country, for miles, to within a short distance of the Depôt Creek.

THE ADELAIDE SERIES.

The road passes from the Hundred of Pichi Richi into the Hundred of Yarrah between Sections 100 and 131 of the last-named Hundred. Within a mile from the boundary a by-road, going in a north-westerly direction, can be followed. This road follows the course of the Ingaree Creek to its head waters, and then, after passing over a low rise, enters the upper valley of the Depôt Creek. The road then ends abruptly at a sharp turn in the creek, about three miles from the main road, where a gate leads into the grounds of Mr. Fitzgerald [Sec. 143E], whose residence is situated a few hundred yards on the left.

The Limestone (Brighton Limestone Horizon).

After passing through the gate, just mentioned, large blocks of limestone occur by the private road leading up to Mr. Fitzgerald's house, near which is a great exposure of limestone forming a hill estimated at 450 feet in height. From the top of the hill a fine view of the surrounding country is obtained, showing purple slates in great development to the southward and westward.

The limestone shows remarkable structures, even under macroscopic examination. The stone carries the double features of being oolitic and brecciated. A microscopic examination helps to elucidate the processes by which it was formed. The formation of oolitic bodies alternated with the brecciation of the sediments. A brecciated angular fragment containing the granular structures is often inincluded in a later deposit, and this, again, has become fractured and included in a still later sediment of a similar type. This is demonstrated not only by the differences in the granular bodies of the respective fragments, but the lines of fracture have, in many cases, passed through the granules which are shown to have been truncated at the edges of the fragments.

In a previous paper [1] in which this limestone was described, the writer suggested a probable enterolithic origin of the brecciation *(loc. cit.,* p. 319) induced by chemical and crystallizing processes during the alteration of the rock by a partial metamorphism.

Taking all the features into account, the writer is now more disposed to refer its origin to a contemporaneous deformation, resulting from what Hyde has called Desiccation Breccia, and Grabau, Intraformational Breccia. If this be a correct interpretation it supplies an interesting sidelight as to the conditions under which the limestone was laid down. Calcareous muddy flats, periodically inundated, followed by evaporation to dryness, are favourable for the development of oolitic and other calcareous concretions; as occur in many parts of south-eastern Australia, at Robe, Biscuit Flat, etc., where oolitic grains build up limestones (see Howchin's Geology of South Australia, 1918, p. 178, figs. 152-

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(1) Howchin, W., "Autoclastic, Intraformational, Enterolitic, and Desiccation Breccias and Conglomerates, with Reference to some South Australian Occurrences," Trans. Roy. Soc. S. Austr., vol. xliv. (1920), pp. 300-321, pls. xvi.-xxi.

154), and the marly flats, under desiccation, break up on the surface into angular fragments to be recemented by a repetition of the process.

Some portions of the limestone carry fine lines that are more or less wavy, a feature often present in the less pure limestones of the Brighton Series.

Passing along the top of the ridge, the beds underlying the limestone come to the surface in the form of hard, fissile slates, a few yards in thickness, and in these a considerable bed of impure limestone. The latter is buff-coloured in weathering, laminated, and develops large concentric lines of lamination, measuring up to 6 feet in diameter.

Towards the northern end of the ridge the beds curve over, forming an anticline.

Shales (Tapley's Hill Horizon).

The true order of succession can be seen by the section exposed on the right bank of the Depôt Creek. The thick limestone caps the hill on the right bank of the creek, near the gate which leads into Mr. Fitzgerald's paddock. Here the limestone is underlain by a fine-grained, laminated shale that is very fissile along the planes of the bedding. This shale can be correlated with the Tapley's Hill beds, and is about 300 feet in thickness.

Near the base of these fissile shales is a buff-coloured limestone, and below the latter are the upper limits of the tillite. A similar impure limestone overlies the tillite in many places further to the southward.

The Tillite.

In the upper portion of the creek, shortly before reaching a sudden turn in the creek at the Teeteetya Spring, several bars of rock cross the creek causing a succession of small waterfalls. The rock is a dark-coloured siliceous shale in which occur small bands of brecciated material containing angular stones. The anticline, mentioned above, as seen on the left bank, rolls gently to the northward. The bands of breccia contain samples of quartz, slates, quartzites, and chert. The latter is a somewhat remarkable and unusual occurrence. The writer cannot remember having observed cherts as forming an element among the erratics of the tillite elsewhere. Some of the bands appear to contain these angular cherts as the main constituent; and one such, situated about 100 yards below the small waterfall was quite angular and measured about 5 inches cube. These layers of breccia vary in thickness from mere lines up to several yards in width, which may form regular layers or irregular deposits. As black-coloured chert occurs in limestones in the Adelaide Series at a lower horizon than the tillite, it raises the question of the possibility of an unconformity existing between the tillite and the cherty limestones.

The strike of the beds is in a north-north-westerly direction, and as the Depôt Creek, in its upper portion, takes a north-westerly course, it is approximately coincident with the strike. A little lower down the creek the tillite makes a wide anticline, as shown in fig. 1. On the right bank the tillite has its limits at about 100 feet above the level of the stream, and is there overlain by the buff-coloured limestone which passes up into a compact slate (or shale) rock. The glacial beds have a much greater development on the left bank, rising nearly to the top of the hill, estimated at 600 feet in height, and are there again overlain by the buff-coloured limestone, the two banks revealing the respective limbs of the anticline.

The tillite was traced for a distance of one and three-quarters of a mile down stream, to the enclosed springs and water pipe, where the creek makes a sharp curve to the westward.

The tillite varies considerably in its lithological features. In the main, it is a gritty mudstone (containing numerous cavities from which included pebbles

have been removed by weathering), coarse grits, siliceous slate, quartzites, breccias, etc. Erratics occur, up to 2 feet in diameter, promiscuously distributed. These consist of quartzites, quartz, various kinds of slate, chert, and muscovite granite. The last-named was rounded, but most of the included stones appear to be angular. A bed of buff-coloured limestone is interbedded with the tillite.

Dip of the tillite, on the right bank, proved to be E. 10° N. at 32°. Observations closed near a high waterfall and the spring mentioned above.

2. MUNDALLIO CREEK.

(Observations made February, 1905.)

The Mundallio Creek takes its rise on the western side of the Devil's Peak-Dutchman's Stern range, in the Hundred of Pichi Richi, and after crossing through the north-western angle of the Hundred of Woolundunga, passes into the Hundred of Davenport, and, after leaving the ranges, becomes lost in the alluvial plains to the northward of Port Augusta. Its exit from the hills is a little to the northward of the gap through which the Quorn and Port Augusta railway passes, and is 14 miles in a S.S.W. direction from the tillite in the Depôt Creek.

At about 12 miles in a north-easterly direction from Port Augusta the road enters the Mundallio Gorge, following the pipe track. Near the mouth of the gorge there is a series of slates, thinnish quartzites, and impure limestones, the latter with much chert in nodules and bands. The general dip is E. at 55° (see fig. 2).

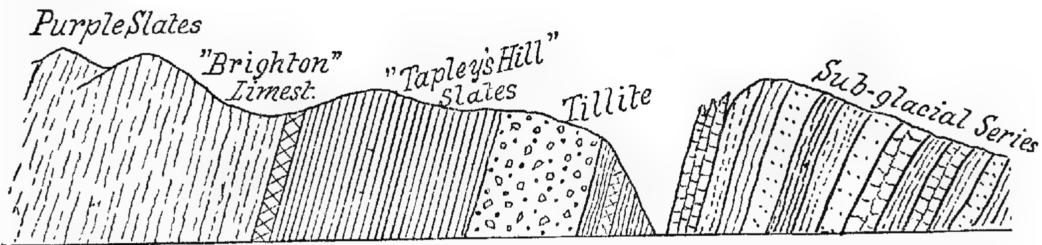


Fig. 2. Sketch Section of Strata in Mundallio Creek.

The crest of the foothills is formed by a very siliceous and strong quartzite, reddish to white in colour, with a thickness of about 50 feet, having a similar dip to that mentioned above. This quartzite is crossed by right-angled jointing, which causes it to weather into edges and pinnacles. Its structure shows resemblances to the subglacial and Mitcham quartzites of the Adelaide Series, whilst the underlying limestone and chert would seem to be congeneric with the calcareous slates and chert of the Burnside beds.

At the place where the creek has cut through the hard quartzite bar the stream bifurcates. One of these feeders comes in from the north and follows along the eastern face of the quartzite, cutting its bed down into the soft laminated shale that overlies the quartzite. The other branch comes in from the eastward. By following up the former of these tributaries, for nearly a mile, an eastern, lateral valley can be entered which cuts across the strike. This lateral creek exposes a series of shales and impure limestones for about 50 yards to 60 yards, and then the tillite puts on.

The Tillite.

From the mouth of the gorge fragments of tillite were noticed among the travelling stones of the creek, so that it became a simple matter to trace them up

to their source. The glacial beds have an exposure of something over 100 yards, and are overlain by a very fissile banded shale, which splits up by weathering into fine laminae. This shale (or slate) corresponds to the Tapley's Hill horizon.

Near the junction of the small creek, mentioned above, and situated above the thick fissile shale, a dolomitic and impure limestone occurs showing an exposure of about 13 yards. This may be regarded as the equivalent of the Brighton Limestone Series.

Following, in ascending order, is a thick series of green and purple slates, overlain by quartzite, which seems to run up to the main range on the eastern side. These purple slates belong to the Archaeocyathinae Series, the fossils appearing at a higher horizon.

The erratics in the tillite are neither so numerous nor so large as occur in some other places. They include quartzites, schists, granites, etc. A few loose granites were seen in the creek bed, one of which was 2 feet in length.

The following table shows the respective beds in the section and their thickness, in descending order:—

Purple slates, etc., of the main range.	Dip E. at 80°-90°,	very thick	
"Brighton" limestone	Do. do.,	30 feet	
"Tapley's Hill" slates	Do. do.,	600 feet	
Gritty and impure limestone	Do. do.,	30 feet	
Brecciated bed	Do. do.,	$2\frac{1}{2}$ feet	
Slaty bed		6 feet	
Gritty limestone		9 feet	Tillite
Calcareous and arenaceous slates with grits and conglomerates; fine silt with distributed boulders, *in situ*, up to 15 inches in diameter		250 feet	
Underlain by slates and impure limestone.	Dip. E. at 80°	150 feet	
Hard quartzite (Mitcham horizon)		50 feet	
Shales, limestone, and chert (to low end of gorge). Dip E. at 55°		(?) 2,000 feet	

3. SPEAR CREEK AND DEEP CREEK, HUNDRED OF WOOLUNDUNGA.

(Observations made September, 1921.)

Spear Creek is one of hundreds of similar creeks that drain the western side of the southern Flinders Ranges. The ranges form a steep fault scarp, facing west, and have been deeply incised by stream action in the form of deep gullies with precipitous faces of 400 feet or more. Spear Creek takes its rise in the foothills of Mount Brown, on its southern side; and Deep Creek, a tributary of Spear Creek, has its rise on the northern slopes of Mount Horrocks to the southward. The gorge, at its entrance, is situated at about 14 miles south-east from Port Augusta in a straight line. Observations were made under the guidance of Mr. F. H. Lehmann, of Catninga.

SHALES (TAPLEY'S HILL HORIZON).

At the mouth of the Spear Creek gorge shales are exposed. These roll slightly across the strike, which causes the angle of dip to vary from about 45° to 60°, in a direction that varies from W. to N.W. The shales are finely laminated in very straight lines and have cubical jointing. They are sometimes calcareous, and in several places considerable deposits of a calcareous tufa ("petrified moss") could be seen *in situ* as well as loose fragments among the gravel of the creek. In one place a bed of limestone, $1\frac{1}{2}$ inches in thickness,

was seen interbedded with the shales. The direction of the creek agreed, to a considerable extent, with the strike of the beds. The petrographical features of the stone, as well as the stratigraphical order, indicate the Tapley's Hill horizon.

Limestone (Brighton Horizon).

About three-quarters of a mile up from the entrance to the gorge, a thick limestone is seen to occur on the top of the cliffs, on the northern side of the gully, resting on the shale beds. It weathers into pinnacles, and from vertical jointing makes a perpendicular face of about 60 feet in height. Some large blocks have fallen from this high-level outcrop and lie in the bed of the creek. The limestone disappears from the top of the gorge, probably set back, and is not seen from below.

At a distance of three and a half miles from the mouth of the gorge, the limestone, with the underlying shales, is thrown down in a vertical position, and by crossing the creek makes a waterfall. The Port Augusta waterworks pipes are carried up the creek to the base of the waterfall. The chief spring which supplies the water service comes to the surface at this point, being thrown out by the sudden down throw of the beds. On the western side of the fault the shales are almost horizontal, but are thrown down with the limestone.

The limestone on passing to the southern side of the creek rises on the bank and is, apparently, cut off by a fault at about 100 feet above the level of the creek. The limestone near the fault plane is much brecciated. Above the fall, there appear to be two beds of limestone with a shaly rock between. Whether this indicated two distinct beds of limestone or a repetition of the same bed was not quite clear. In places the limestone shows a wavy structure as often occurs at certain horizons in the Brighton limestone beds.

The Tillite.

Deep Creek is an affluent of Spear Creek and unites with the latter at a short distance up from the mouth of the gorge, coming in from a more southerly direction, and brings into view beds on a slightly lower horizon than those in

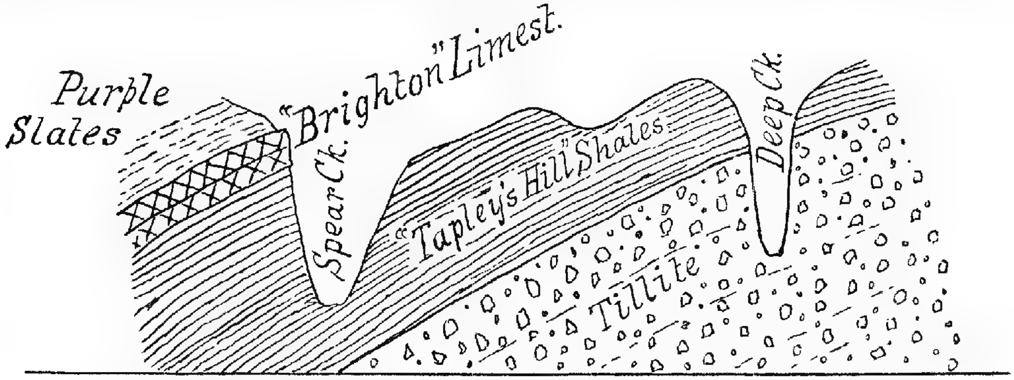


Fig. 3. Sketch Section transverse to Spear and Deep Creeks; western Scarp of Southern Flinders Ranges; 14 miles south eastward of Port Augusta.

Spear Creek (see fig. 3). The Tapley's Hill shales not only form the chief exposures in Spear Creek, but also form a high ridge between the latter and Deep Creek.

At about three-quarters of a mile up Deep Creek from the point of junction, the tillite makes its appearance as it rises from beneath the shales with which it is conformable and shows a dip of 40° to the W.N.W. The ground-mass of

the tillite is the usual mudstone, varying in colour in shades of black, bluish, or drab. In the upper portions of the bed there are fewer large erratics, but they contain layers and irregular masses of a coarse grit, the particles varying in size up to an inch or more in length, and are very angular. Erratics occasionally occur up to 6 inches or a foot in diameter, consisting of quartz, quartzites, slates, metamorphic rocks and granite.

The creek follows in a general way the strike of the beds, and was followed up for about half a mile. Remarkable sections are exposed in a narrow gorge, where the cliffs rise 150 feet to 200 feet in tillite. In the upper portions of the creek larger erratics occur, mostly quartzites and granites, some of the latter measuring from a foot to 21 inches in length; one example measured 22 inches by 14 inches, set in a fine-grained matrix. There appears to be a greater number of angular as compared with waterworn erratics.

The lateness of the day arrested observations before the base of the tillite was reached.

4. BAROOTA CREEK WITH ITS TRIBUTARIES, SEPARATION CREEK AND WATERFALL CREEK.

(Observations made in May, 1904.)

Baroota Creek is the most important outlet for the drainage that comes from the western side of the southern Flinders, and is one of the few streams from the hills that can maintain its flow over the six or seven miles of alluvial plain that separates the hills from the sea. The main creek and its tributaries take their rise in the highlands that lie to the westward of Mount Remarkable. This westerly range is known, locally, as the Black Range, probably taking its name from the dark-coloured purple slates which are a dominant feature in the geological structure of the range, and are noted on some of the Government maps as "chocolate" rock country. In a geological sense the region is in a juvenile stage of relief, with steep, narrow gorges, and from the friable nature of the rock-mass the steeper slopes are bare and unproductive. The maritime plain, built up by the alluvial fans, has a gradual rise to the foot of the hills, but the latter show an abrupt face to the west.

Separation Creek.

The Baroota Creek, in the lower portion of its gorge, has a considerable width of bed, with much gravel. The enclosing walls consist of Tapley's Hill banded slates with a dip W. at 35°. As the gorge is penetrated, the walls increase in height up to, probably, 1,000 feet. As soon as the gorge was entered, the "spoor" (to use a hunter's term) of the tillite was observed among the gravel of the creek bed. This clue was followed along the western edge of the creek bottom for about a mile and a half, to the junction which Separation Creek makes with the main creek. It was here noted that the fragments of tillite came down the Separation Creek and were followed in that direction. The creek was still in Tapley's Hill slates, but at a distance up of about three-quarters of a mile a slight anticline occurred in the beds which brought up the tillite into the bed of the creek. The dip had changed to N.N.E. at a low angle. The glacial beds thus formed the axis of the fold in an exposure of a few feet at the apex and had a longitudinal extension of about 30 to 40 yards.

Waterfall Creek.

The exposure in Separation Creek was evidently too limited to account for the amount of tillite *débris* that occurred near to the entrance of the Baroota gorge, so that at a little later date another visit was made to the locality.

This time, following the eastern side of the Baroota Creek, within about half a mile from the mouth of the gorge, the Waterfall Creek joins the main stream. The Waterfall Creek, like the Separation Creek, has an east-west course, and thereby cuts across the strike. At the junction of the two streams Tapley's Hill slates are in evidence, but within a short distance the tillite rises from beneath these slates. Unfortunately, the stream, after heavy rains, was in flood, which made the narrow gorge impassable. A course was then taken along the left bank of the stream. In the upper portion of the tillite a laminated shale is included in the bed, showing a dip W. at 50°. The glacial outcrop was followed at high level to the top of the range. In the latter position the tillite shows rock-cleavage that has a direction along the strike of S. 20° W. and dip, easterly, at 70°. The beds are very thick and characteristic, comprising the coastal ridge including the valley on the eastern side of the ridge. The texture is strongly arenaceous with numerous erratics. Very large quartzite erratics are not uncommon. A red-coloured quartzite towards the top of the ridge measured 7 feet by 6 feet; several others 3 feet by 3 feet. The red porphyry type of erratics is well represented.

The waterfall, from which the creek takes its name, is in the tillite. Leaving the stream the tillite continues to form the ridge in a south-easterly direction, in a width of about half a mile, and was traced to the eastern limits of the Hundred of Baroota. From there it was followed, with some uncertainty, for two miles, down the hill behind the Gorge Hotel, to a definite exposure on the public road at a quarter of a mile to the eastward of the hotel.

5. MOUNT REMARKABLE.

The tillite that occurs in Spring Creek, on the western side of Mount Remarkable, is situated in a line about three miles to the eastward of the Baroota Creek outcrops, but while set back from the western scarp of the ranges it really forms a link in the chain of exposures dealt with in the present paper. As the Mount Remarkable occurrences have already been described (Howchin, W., "The Geology of Mount Remarkable," Trans. Roy. Soc. S. Austr., vol. xl., 1916, pp. 545-580, pls. liii., liv.), it is only necessary here to call attention to the fact.

6. THE BACK CREEK (GORGE) ROAD.

(Observations made in May, 1904.)

The Back Creek by its incised and tortuous course has made a pass down the scarp of the western range by which communication from the back country can be obtained to Port Germein and the coastal plain. The pass is not only highly picturesque, but supplies a most interesting geological section of a part of the range. The respective rocks of the locality are similar to those seen to the northward, already described, but by a reversal of dip the physical features of the country are modified. To the northward, Mount Remarkable and the Black Range are rugged and mountainous; while the country at the head of the Back Creek gorge is relatively level and well cultivated. This suppression of relief is less favourable for the determination of the geological features.

Beds above the Tillite.

The Gorge supplies a very impressive view of the quartzite series, often pitched at a high angle in cliffs of a great height. Approaching the Gorge from the Port Germein side the first sign of bed-rock is a decomposed slate rock followed by calcareous beds and chert, the latter occurring in nodules and bands having a dip S.W. at 65°. A little higher up are laminated shale beds presenting a bold face with dip W.S.W. at 78°. At the big quarry, in a cliff face of 200 feet,

or more, are thinnish beds of quartzite, much jointed, breaking up cuboidally, dip W.N.W. at 46°. At seven and a quarter miles from Port Germein quartzites dip in the same direction at 30°, and at about a mile further up the gorge, quartzites dip N.N.W. at 26°.

Following the road, going eastwards from the top of the gorge, about half a mile before reaching the Gorge Hotel, in a small creek and in a quarry by the side of the road, a bluish calcareous shale, 14 feet in thickness, is seen inter-bedded with the quartzites showing a dip N.E. at 40°. The associated quartzites, on weathering, show line markings. There is also a quarry in the quartzites, opposite the hotel, having a dip E.N.E. at 26°.

Three hundred yards further along the road, going easterly, alternations of slates and thin quartzites occur with same direction of dip as the preceding at 48°.

One hundred and fifty yards further, resting on slates, is a buff-coloured dolomitic limestone, 4 feet in thickness, seen in a quarry, in paddock, near the road, maintaining the same direction of dip, at 35°; overlain by laminated shales.

The Tillite.

At a quarter of a mile to the eastward of the Gorge Hotel the tillite is seen in outcrop in paddock and in a cutting on the road. In the latter the section includes 12 feet of quartzite and hard slate with a dip E. 20° N. at 55°. At 150 yards further along the road is a strong argillaceous quartzite that makes an exposure 10 yards wide, and is overlain by tillite.

The western limits of the tillite occur a quarter of a mile to the eastward of the hotel, and its eastern boundary is within about 100 yards of the deep cutting at the "Blue Hill," on the rise of the hill, about a mile from the hotel. The contained erratics are rather small in size.

Beds above the Tillite.

The deep cutting on the road, mentioned in the last paragraph as following on the exposure of the tillite, shows a change of rock to laminated slates, with some superficial travertine, having a dip E. 20° N. at 50°. At the eastern end of the cutting the dip increases to 80°. The stone splits into thin laminae on the bedding, is strongly jointed, which is slightly oblique to the bedding, and has a feeble prismatic cleavage. It has a close resemblance to the Tapley's Hill banded slates.

On the eastern side of the cutting, in the same class of rock, there is a great show of quartz at the surface in scattered fragments and "blows," and, in places, thin bands of calcareous shale appear. General dip at 84°.

In a bend of the road (Sec. 459, Hundred Wongyarra) strong bands of bluish siliceous limestone occur. At the bottom of the valley, on the southern side of the road, in a small tributary creek, are fine-grained quartzites and slates with a dip E. 20° N. at 52°-75°.

From this point, for several miles on the way to Murray Town, there are alternations of greenish slates and quartzites (the former predominating), making low undulating hills, richly grassed, and large trees in park-like order. The direction of dip varies from north-west to north-east, and was recorded at angles varying from 38° to 72°.

The reversal of dip between the respective localities of Baroota and the Gorge—the former pitching to the west and the latter to the east—is of great importance in the geological structure of the country. At Baroota, the Tapley's Hill beds (situated above the tillite) form the scarp facing the sea; while at the Gorge the Mitcham quartzites and shales (situated below the tillite) occupy this position, with an ascending order of beds to the eastward, instead of a descending order, as at Baroota.

The interpretation of the geological discrepancy may be in the fact that in the gorge proper the quartzites dip westerly, while at the top of the gorge they dip easterly. This suggests an anticline in which the preglacial beds, not seen at Baroota, are heaved up at the gorge, which has had the effect of reversing the order of the beds as they outcrop to the eastward.

The great display of quartz, breaking through the Tapley's Hill beds, mentioned above, may have some connection with the tectonic movements; as also may the extraordinary crush phenomena and faulting that have occurred at Mount Remarkable, a few miles to the northward (see Howchin, W., "Geology of Mount Remarkable," *loc. cit.).*

Telowie Gorge.—As bearing on this subject, an observation made in the Telowie Gorge (situated three miles to the southward) may be mentioned. The gorge shows a great exposure of thin- and thick-bedded sandstones and quartzites, sometimes false bedded, which were followed up for about a mile and a half. Dip W.N.W. at 65°. No other kind of rock was seen *in situ* or recognized among the gravel of the creek. In some places the stone contains nodular structures of the same kind of rock.

7. CRYSTAL BROOK.

(Observations made in May, 1903, and April, 1928.)

The township of Crystal Brook is 365 feet above sea level. The creek which gives its name to the township is, in its lower reaches at low grade, approaching base-level. No rocks are seen in the bed of the creek from Crystal Brook to its junction with the Broughton River in a distance of nine miles by the stream and six miles by direct measurement. Near Crystal Brook the creek has cut its bed deeply into clay banks and flats with ancient river terraces on either side. The bed is sandy and dry except in the wet season.

The first indication of hard rocks in the bed of the creek is at a distance of about half a mile from the township, appearing at lowest levels with the characteristics of the Tapley's Hill slates. At a little higher up the stream a well-exposed quarry in these beds is seen on its left bank. Here the stone is regularly bedded in very even lines with a dip W. 20° S. at 30°. The rock possesses a rough type of cleavage, as in the type district, which causes it to split more readily on the cleavage planes than otherwise. It is softish and is quarried for binding of metal on the roads.

The same rock is exposed on the southern slopes of the hill behind the township, and is there reduced to a white kaolinized rock that has almost lost the evidence of its bedding and cleavage planes. It has been extensively opened out and quarried for the Port Pirie Smelting Works.

The Tapley's Hill beds continue to show as bars of rock crossing the stream with their dip slopes down stream causing small waterfalls with waterholes on the down side. These continue in outcrop until the slaughter yards are reached, situated on the right bank, with a windmill that pumps up water from the creek.

For a length of about 200 yards on the eastern side of the slaughter yards the Tapley's Hill slates disappear from the bed of the stream which forms a level stretch of reeds growing in shallow water. At the eastern end of this marshy flat the tillite appears as a very strong exposure across the stream and in the banks on either side. The bed is roughly cleaved, showing a cleavage dip of from 40° to 50° to the eastward, with a slightly variable line of strike. This feature is pretty constant, and might be confounded with the bedding planes, which are in the opposite direction. The bed is well studded with erratics, which are conspicuously shown on the hard rock faces that have been ground smooth within the limits of the flood waters.

The erratics are not particularly large, but plentiful and of varied types, quartzites being the most common. Igneous rocks are comparatively rare, but include fine-grained granite, grey-coloured quartz-felspar porphyry, a dark-coloured, almost black, porphyry, and a single example of a metamorphic augen gneiss, such as occurs in the Humbug Scrub Pre-Cambrian. The largest erratic noticed was a quartzite, set in the tillite, that measured 3 feet by 2 feet 9 inches.

At a distance of 200 yards from the first appearance of the tillite there is an affluent that comes in from the north (on the right bank of the creek), which is on the direct strike of the tillite. This tributary was followed up for 200 yards, the tillite being well exposed and continued in the same direction indefinitely.

There is a continuous exposure of the tillite from near the slaughter yards, mentioned above, upstream, for about half a mile, to some old station buildings situated in the fork made by the Crystal Brook Creek and an important tributary that comes in from the south-east.

The tillite maintains a general resemblance throughout, barring a few thinnish beds of a slaty or sub-quartzitic nature which appear to be destitute of erratics and are described below. The lower portions of the tillite partake of a more compact slaty type with fewer erratics than the upper portions.

The surface measurements of the tillite extend to about 40 chains. If the general angle of dip be taken at about 30°, it indicates a vertical thickness of about 1,240 feet, as shown below:—

	Feet
1. Tillite with numerous erratics	300
2. Close-grained banded quartzite	1
3. Blue shale, very regular in its bedding and very sharp in its junction with the tillite below (5 inches)	
4. Tillite	50
5. Band of shale in tillite	1
6. Tillite with grits at base	224
7. Bluish and shaly quartzite, marked by numerous fine lines that simulate laminae	24
8. Thick tillite, rather slaty in lower portion	640
	1,240

Underlying Beds.

On the eastern side of the old station buildings (described above) there are outcrops of thinnish quartzites with a thin bed of greyish-coloured dolomitic limestone; and at a short distance to the eastward, at the turn of the road is a quartzite quarry from which building stones have been won.

AUSTRALIAN CURCULIONIDAE OF THE SUBFAMILIES HAPLONYCIDES AND CRYPTORHYNCHIDES.

By Arthur M. Lea, F.E.S.
(Contribution from South Australian Museum.)

[Read June 14, 1928.]

Plates VII. to IX.

The Haplonycides have been much neglected, but comprise an interesting section of the Curculionidae, as they live in woody galls of the Homopterous genus *Apiomorpha (Brachyscelis)* on *Eucalypti*, but one species of the genus *Sigastus* lives in *Cylindrococcus* galls on *Casuarina*. The subfamily is almost confined to Australia. In the Cryptorhynchides, of the large genus *Poropterus*, some new species are dealt with, but in addition figures from photographs are given of many species not previously illustrated.

HAPLONYCIDES.

Haplonyx fasciculatus, Boh.

H. myrrhatus, Pasc.	*H. insolitus*, Chev.
H. turtur, Pasc.	*H. macleayi*, Chev.
H. ustipennis, Pasc.	*H. occipitalis*, Chev.
H. venosus, Pasc.	*H. rusticula*, Chev.
H. donovani, Chev.	*H. waterhousei*, Chev.

I have previously (1) commented upon the great variability of this common and widely distributed species, and I now believe that the whole of the forms referred by Chevrolat to his second division, are referable to it, and that *H. myrrhatus* and *H. ustipennis* are additional varieties. A specimen from Bundaberg (Queensland) has the clothing of the upper surface entirely black.

Haplonyx niveodispersus, Lea.

The type of this species was from an unknown locality. There are now before me many specimens from South Australia (Lucindale, Port Lincoln, and Kangaroo Island). Their derm varies from a dingy reddish-brown almost to black, and their size ranges 3·5-4·5. mm.

Haplonyx nasutus, Lea.

Many specimens of this species have the derm (the head excepted) almost entirely reddish.

Haplonyx punctipennis, Lea.

There are now before me many specimens of this species from Dalby (Queensland); in general appearance they resemble *H. centralis*, on a small scale, except that they have (unless abraded) a narrow median fascia of white scales on the elytra; the derm varies from a dingy-red to piceous-brown.

Haplonyx ericeus, Pasc.

The commonest form of this species has the derm almost entirely black, but on many South Australian specimens it is of a more or less dingy-red, and the clothing is more variegated, with the scutellum appearing blackish (as on

(1) Lea, Proc. Linn. Soc. N.S. Wales, 1897, p. 630.

H. cionoides and *H. sexvittatus*). Three specimens from Lucindale and Adelaide are unusually small, 4·0-4·5 mm.

Haplonyx maximus, n. sp.

Black, some parts obscurely reddish. Moderately clothed with thin white scales or setae, uniform on the under parts, somewhat variegated on the upper surface; the suture with fairly dense, sloping, and mostly dark setae; with a few fascicles.

Rostrum slightly longer than prothorax, with a thin median carina, and coarse, partially confluent punctures to apical third, in front with smaller but quite sharply defined ones. Prothorax subconical, base more than twice the width of apex, sides impressed near apex; with coarse granules, irregular in places and absent from a short median line. Elytra subcordate, shoulders rounded but rather prominent; with rows of large deep punctures, on basal half usually wider than interstices, but becoming smaller posteriorly; rather densely granulate. Legs long; femora acutely dentate, the front ones with or without a small supplementary tooth in the notch; front tibiae feebly bisinuate. Length, 9-12 mm.

Western Australia: Beverley (E. F. du Boulay), York (Blackburn's collection).

Very distinct from all previously named species by its great size. Although there are seven specimens under examination, I am unable to find any sexual differences in the rostrum and abdomen. At first glance several of them appear to be entirely black, but only one has the derm completely so, all the others have at least the legs partly reddish, and most have the upper surface more or less obscurely mottled. On the type and a second specimen there are four small fascicles on the front of the pronotum, forming the corners of a small square; on each elytron there is a distinct black fascicle on the middle of the third interstice, and a smaller one (mostly white), one-third of the distance between it and the apex; on the fifth there are two feeble ones; but the scales and fascicles appear to be easily abraded, as on most of the other specimens the only fascicles left are those on the third interstice.

Haplonyx elongatus, n. sp.

Of a dingy reddish-brown, antennae and tarsi blackish. Moderately clothed with white scales, varying to stramineous or ochreous, on sides of prothorax and of mesosternum; and with numerous small black fascicles.

Rostrum rather short and wide; with crowded, sharply defined punctures. Prothorax moderately transverse, base not twice the width of apex; with crowded punctures. Elytra oblong-cordate, parallel-sided to beyond the middle; with rows of large deep punctures, mostly the width of interstices. Legs stout, femora strongly dentate, the front ones with a small tooth in the notch; front tibiae moderately bisinuate. Length, 5 mm.

South Australia: Barton (A. M. Lea), unique.

More elongate than *H. fasciculatus*, and elytra parallel-sided to beyond the middle, with the shoulders rounded off. There are four small fascicles on the pronotum in the usual positions; on the elytra there are three transverse series of four fascicles on the third and fifth interstices, the first subbasal, the second median, and the third postmedian; the scutellum and the suture just beyond it are also subfasciculate. As its rostrum is noncarinate, the type is probably a female.

Haplonyx scoparius, n. sp.

Blackish-brown; rostrum, antennae, and legs obscurely diluted with red. Densely clothed with white, variegated with stramineous scales, and with somewhat stramineous fascicles.

Rostrum moderately wide, slightly longer than prothorax, not quite straight; with coarse, crowded punctures. Prothorax subconical, base about twice the width of apex, derm normally concealed. Elytra briefly cordate, much wider than prothorax. Femora stout, strongly dentate, without a small tooth in the notch; front tibiae strongly bisinuate, the median projection nearer the base than the subapical tooth. Length, 5 mm.

Queensland: Bundaberg, unique.

The general outlines are much as those of *H. fasciculatus*, but the fascicles are even more numerous, including two small ones on the head; on the pronotum there are eight in two transverse series, of which the outer ones of the second series are marginal; on the elytra there are four on each of the third, fifth, and seventh interstices, and a feeble one on each of the second, fourth, and sixth; the clothing behind the scutellum is also dense and stramineous. The elytral punctures are evidently of large size, but they are almost entirely concealed by the scales, which are large and flat.

Haplonyx obliquatus, n. sp.

Black, parts of upper surface diluted with red, antennae (except club) and legs reddish. Densely clothed with variegated scales, and with numerous short and usually black fascicles.

Rostrum short, stout, and straight; punctures concealed, except about muzzle. Prothorax strongly transverse, sides strongly rounded, base almost twice the width of apex; with crowded punctures. Elytra briefly cordate, outlines (owing to the obliquity of the shoulders) subcontinuous with those of prothorax; with rows of large partially concealed punctures. Femora stout, strongly dentate, the front ones each with a distinct supplementary tooth in the notch; front tibiae moderately bisinuate. Length, 3·5 mm.

Torres Straits: Mabuiag Island (C. T. McNamara), unique.

Structurally rather close to *H. multicolor*, but with more numerous fascicles on elytra, pale clothing of prothorax not directed to fascicles, and front tibiae shorter and more strongly bisinuate. Most of the scales of the upper surface are more or less of a rusty-brown, becoming white on the under surface. The rostrum is clothed almost to the muzzle; on each side of the pronotum there is a whitish, oblique vitta, from base to apex, and remnants of others on the margins, along the middle there is a feeble ochreous vitta, the scales elsewhere being blackish; on the elytra whitish, rusty, and sooty scales are intermingled. On the pronotum there are four small fascicles forming the corners of a small square; on each elytron there is a small one on the second interstice about the middle, two antemedian ones on the third, three on the fifth, and a feeble one on the shoulder.

Haplonyx circularis, n. sp.

Dull reddish-brown, some parts darker, antennae (club excepted) and legs paler. Densely clothed with variegated scales and with numerous small fascicles.

Rostrum slightly longer than prothorax, flat and almost straight, with a narrow median carina almost to apex; with crowded punctures, naked only in front of antennae. Prothorax briefly subconical, base more than twice the width of apex; with crowded, concealed punctures. Elytra briefly cordate, outlines subcontinuous with those of prothorax; with large deep punctures, partially or quite concealed by clothing. Femora stout, strongly dentate, the front ones each with a distinct supplementary tooth in the notch; front tibiae feebly bisinuate. Length, 3-4 mm.

Queensland: Cairns (F. P. Dodd), Kuranda, Brisbane (H. J. Carter), Imbil, from stomach of a "thickhead," *Pachycephala gutturalis* (S. A. White).

An unusually broad and very distinct species, with an almost circular outline. The clothing varies considerably, on most specimens it is whitish or stramineous on the under parts, and distinctly variegated on the legs. On the upper surface the scales are mostly of a chocolate-brown, with two conspicuous whitish or stramineous oblique vittae on each side of the prothorax, the inner vitta continued so as almost to meet behind the second pair of fascicles, on some specimens they actually do meet after being angularly drawn backwards; the outer vitta on each side is usually broken up, and its base appears as a well-defined spot from the side; on the elytra there is a large patch of pale scales occupying a wide space on the apical slope. On one specimen the clothing of the prothorax and elytra is black, except for the large pale apical patch, on another the prothoracic vittae are distinct, but the pale apical patch of the elytra is darker than usual, although its margins are sufficiently defined; on another much of the base of the elytra is clothed with whitish scales. On the pronotum there are four small black fascicles in the usual positions; on the elytra the fascicles are mostly rusty-red or ochreous; and placed in a large basal triangle, the longest is at the middle of the second interstice; there are two on the third before the middle, and one on the fifth at the basal third, remnants of other fascicles may be traced, and there is usually a blackish, velvety patch about the scutellum. On abrasion the largest fascicles on the elytra are seen to be supported on slight elevations, the interstices at their positions being wider than elsewhere. On several specimens the rostrum is slightly longer and thinner than on others, and the abdomen is slightly more convex, so they are probably females.

Haplonyx submaculatus, n. sp.

Black, some parts obscurely reddish. Moderately clothed with thin white scales and setae, uniform on the under parts, but mixed with a few feeble fascicles on elytra.

Rostrum stout, scarcely the length of prothorax; with crowded punctures, partially concealed before insertion of antennae. Prothorax strongly transverse, base about twice the width of apex; densely granulate-punctate. Elytra briefly subcordate, outlines subcontinuous with those of prothorax; with rows of large punctures slightly obscured by clothing, interstices densely granulate. Femora stout, strongly dentate, the front ones each with a small supplementary tooth in the notch; front tibiae moderately bisinuate. Length, 4·0-4·5 mm.

South Australia: Lucindale (B. A. Feuerheerdt and F. Secker).

Allied to *H. fasciculatus*, but the elytra with very weak fascicles and the prothorax with none. Of six specimens, probably all males, two have the derm black, except for the scape, funicle, and parts of legs, the others usually have the metasternum, abdomen and head, and sometimes the rostrum, black, the other parts being obscurely reddish, or obscurely mottled with red, the mottling apparently increased by the clothing. The clothing of the pronotum is uniform, except that there appear to be several feeble dark spots due to partial absence of scales; on the elytra there are three transverse series of feeble dark spots, representing the series of fascicles of other species, the spots mostly due to the absence of scales. On each elytron there are two small fascicles of dark scales, one on the third interstice about the middle, the other on the fifth; seen from behind they are sufficiently distinct and their supporting interstices to be slightly elevated above the adjacent ones.

Haplonyx tasmanicus, n. sp.

Black; elytra, legs, scape, and funicle obscurely reddish. Moderately clothed with variegated scales, and with a few fascicles on elytra.

Rostrum wide, feebly dilated to apex, scarcely the length of prothorax; with a fine median carina and coarse, confluent, partially concealed punctures on basal

half, elsewhere with smaller but sharply defined naked punctures. Prothorax strongly transverse, apex about two-thirds the width of base, densely granulate-punctate. Elytra oblong-cordate, shoulders rounded, sides subparallel to beyond the middle; with rows of large rough punctures, the interstices densely granulate. Legs rather long, femora acutely dentate; front tibiae bisinuate on lower surface. Length, 5·5-6·0 mm.

Tasmania (Aug. Simson), Hobart (H. H. D. Griffith).

A comparatively elongate species, with outlines much as on *H. elongatus*, but with fewer fascicles. The tooth on each of the front femora is nearer the base than is usual, and there is no supplementary one in the notch. The clothing of the pronotum is mostly rusty-yellow, and has a slight multimaculate appearance owing to being sparser in places; on the elytra it is rusty at the base and elsewhere, except that there are three feeble whitish fasciae: one at the basal fourth, one median, and one at the apical fourth; the sides of the mesosternum and metasternum are more densely clothed than elsewhere. On each elytron there are two small black fascicles on the third interstice, one before and one behind the first whitish fascia. On the Hobart specimen the club is scarcely darker than the rest of the antennae, the median projection of the front tibiae is less acute, and the elytral fascicles have been abraded, but their positions are indicated by slight elevations, on which the granules are denser than elsewhere.

Haplonyx suturalis, n. sp.

Dull reddish-brown, scutellum and metasternum darker, antennae paler. Moderately clothed with variegated scales, becoming uniformly white on under parts; elytra with some small black fascicles.

Rostrum slightly longer than prothorax; basal half with a feeble median ridge and coarse confluent punctures, elsewhere with smaller but more sharply defined ones. Prothorax strongly transverse, sides strongly rounded, becoming subtubular in front, apex slightly more than half the width of base; coarsely granulate-punctate, except in front. Elytra oblong-cordate, distinctly wider than prothorax; with rows of large, rough punctures; interstices densely granulate. Legs moderately long, femora strongly dentate, the front ones each with a supplementary tooth in the notch. Length, 6 mm.

Northern Territory: Darwin (W. K. Hunt), unique.

The general outlines are as in the preceding species, but there are more fascicles on the elytra, the front tibiae are less strongly bisinuate, the large tooth of each front femur is in the usual position, and there is a small supplementary one in the notch. The scales on the pronotum are rusty-yellow and white, irregularly mingled, but with a slightly vittate appearance; on the elytra they are mostly rusty-brown or chocolate-brown, with scattered whitish and black ones, in places condensed into feeble spots; the suture is densely clothed almost to apex, the scales being mostly black, with irregular alternations of rusty-brown. On each elytron there are two small fascicles on the third interstice, one just before the middle, the other just beyond it, and two on the fifth similarly placed.

Haplonyx annularis, n. sp.

Dark reddish-brown, antennae paler. Moderately clothed with variegated scales, becoming white on under parts; elytra with feeble blackish fascicles.

Rostrum slightly curved, about the length of prothorax, sides slightly incurved at insertion of antennae; with feeble ridges and coarse confluent punctures on basal half, smaller and more sharply defined in front. Prothorax strongly transverse, apex about two-thirds the width of base; densely granulate-punctate. Elytra cordate, outlines subcontinuous with those of prothorax; with rows of large rough punctures, partly concealed by clothing, interstices multigranulate.

Femora stout, strongly dentate, the front ones each with a small supplementary tooth in the notch; front tibiae moderately bisinuate on lower surface.

Northern Queensland (Blackburn's collection). New South Wales: National Park (A. M. Lea).

About the size of *H. punctipennis*, and with a similar scutellar ring, but more densely clothed, rostrum stouter and somewhat curved, and front tibiae less strongly bisinuate; *H. sexvittatus* and *H. cionoides* have the rostrum considerably longer (both sexes); *H. centralis* is larger, with a much wider scutellar ring. On the type the scales on the upper surface are mostly chocolate-brown, variegated with rusty-yellow vittae on the pronotum, and small spots on the elytra; there is a black scutellar patch surrounded by a pale ring; on each side of the prothorax there is a conspicuous oblique vitta, which at the base is divided to enclose a small dark spot. There are two feeble fascicles on the third interstice on each elytron, two more feeble ones on the fifth, and remnants of others may be traced, but even from the sides they are not very distinct. The specimen from New South Wales has the derm of the upper surface almost black, and the paler scales almost or quite white, but the scutellar ring and prothoracic vittae are otherwise as on the type.

Haplonyx bifasciculatus, n. sp.

Black; elytra, legs, and antennae reddish. Moderately clothed with variegated scales; each elytron with a black fascicle.

Rostrum about the length of prothorax; with coarse, partially concealed punctures on basal half, naked and smaller in front. Prothorax subconical, base about twice the width of apex, densely granulate-punctate. Elytra subcordate, basal half almost parallel-sided; with large rough punctures, the interstices with numerous granules. Femora stout, acutely unidentate; front tibiae strongly bisinuate on lower surface. Length, 4 mm.

Tasmania: Stonor, Devonport (A. M. Lea). New South Wales: Meadow Flat (T. G. Sloane).

A small species, distinct from *H. submaculatus* and similar species, by the unidentate front femora, and single black fascicle on each elytron. *H. unidentatus* is a multifasciculate species. On the pronotum most of the clothing is of a rusty-yellow and condensed into feeble oblique vittae; on the elytra the scales are sparsely distributed, and rusty-yellow and sooty, with a few small whitish spots, but there is a conspicuous black fascicle on the third interstice at the basal third; on the under surface the scales are whitish, except on the sides of the sterna, where they are rusty-yellow. The median projection on the front tibiae is quite as acute as the subapical tooth. The specimen from New South Wales is slightly larger (4·5 mm.) than the others, and with somewhat paler clothing, which on the elytra is feebly fasciate in arrangement.

Haplonyx rufobrunneus, n. sp.

♂. Dark reddish-brown; scape and funicle paler. Moderately clothed with somewhat variegated scales.

Rostrum slightly longer than prothorax and scutellum combined, almost straight; with a feeble median carina and coarse confluent punctures, becoming smaller and more sharply defined in front. Prothorax strongly transverse, sides strongly rounded, becoming subtubular in front, which is scarcely half the width of base, densely granulate-punctate. Elytra briefly subcordate, base strongly trisinuate; with rows of large deep punctures, the interstices multigranulate. Legs moderately long, femora strongly dentate, and each with a small tooth in the notch; front tibiae strongly bisinuate, the subapical tooth smaller than usual. Length, 6-7 mm.

♀. Differs in having the rostrum longer (almost twice the length of prothorax), thinner, with somewhat smaller punctures, and antennae inserted in middle of sides of rostrum, instead of about two-fifths from apex.

South Australia: Karoonda to Peebinga (G. E. H. Wright), Wirha (Dr. E. W. Ferguson), Port Lincoln (Rev. T. Blackburn and A. M. Lea).

In some respects, especially in the long rostrum, close to *H. nasutus*, but the derm reddish, and clothing different. The absence of fascicles distinguishes from *H. ericeus*, and all its varieties. Most of the clothing of the upper surface is of a more or less rusty-yellow colour (often with a distinct golden gloss in certain lights), becoming white on most of the under surface and legs. On the head there are usually two small whitish spots; on the pronotum there are also a few white spots; the rusty clothing, although dense on the sides, has a slightly vittate appearance there; on the scutellum it is sooty; on the basal third of the elytra there is a fairly distinct but very irregular fascia, due to the clothing being sparser and darker in its vicinity; just beyond the middle there are remnants of a smaller and less distinct fascia; there are also single white round scales, confined to the striae on most specimens. Two from Port Lincoln are smaller (4·5-5·0 mm.) than usual, and are without white scales in the striae. Another, from Wirha, is still smaller (4 mm.), and the two elytral fasciae are more distinct than usual, partly owing to an admixture of whitish scales on the adjacent parts. Two specimens from Eyre's Sand Patch are of normal size, but are almost black, parts of the antennae excepted.

On this and all the following species the prothorax and elytra are non-fasciculate, on all the preceding ones the elytra at least are fasciculate.

Haplonyx foveipennis, n. sp.

♂. Reddish-brown, club and parts of under surface darker. Moderately clothed with scales, mostly rusty-yellow on upper surface, mostly white on under parts.

Rostrum rather wide, slightly longer than prothorax, with a narrow median carina and coarse confluent punctures to apical third, in front with smaller but sharply defined punctures. Prothorax subtubular in front, where the width is slightly more than half the width of base, densely granulate-punctate. Elytra elongate-cordate, distinctly wider than prothorax, with rows of large, deep, oblong punctures; interstices granulate. Legs moderately long, femora acutely dentate, the front ones each with a small supplementary tooth in the notch; front tibiae bisinuate, the median projection equidistant between base and the subapical tooth. Length, 6-7 mm.

♀. Differs in having the rostrum decidedly longer (slightly longer than prothorax and scutellum combined), its carina and the confluent punctures not passing the middle, the prothorax somewhat narrower in front, and, in conjunction with the head, more triangular in appearance, the abdomen more strongly convex, and the front legs somewhat shorter.

Queensland: Longreach, in January (A. M. Lea), Flinders Island, in January (H. M. Hale and N. B. Tindale).

A large species, with unusually large elytral punctures, which, except posteriorly, are wider than the interstices. It is slightly narrower than the preceding species, and the sinuation of the base of the elytra is much less pronounced. The rostrum is of considerable length in the female, about as long as on the male of *H. nasutus*. On two specimens (sexes) the scales on the pronotum are fairly dense, rusty-yellow, and more or less vittate in arrangement, on the elytra they are also mostly yellowish, but are much sparser (not interfering with the apparent size of the punctures), and, in addition, there are single, round, white scales in

many of the punctures, and a short strip of black ones on the third interstice at the basal third; the black ones are not sufficiently dense or erect to be considered as forming a fascicle, they are very distinct on the island specimen, fairly distinct on the Longreach female, but have been abraded from the type male. On the Longreach female the scales on the pronotum are paler, becoming white at the base, and the scales on the apical half of its elytra are fairly dense.

Haplonyx brevirostris, n. sp.

♂. Dull reddish-brown, scutellum and parts of under surface almost black. Moderately clothed with whitish or stramineous scales on upper surface, black on and about scutellum, entirely white on under parts.

Rostrum broad, slightly shorter than prothorax, not twice as long as wide; with feeble ridges, and coarse crowded punctures behind antennae, crowded but less coarse in front. Prothorax strongly transverse, apex about two-thirds the width of base; densely granulate-punctate. Elytra cordate, outlines subcontinuous with those of prothorax; with large, oblong, deep punctures, interstices with numerous ones. Femora stout, strongly dentate, front ones each with a small tooth in the notch; front tibiae with median projection slightly nearer subapical tooth than base. Length, 4·5-5·0 mm.

♀. Differs in having the rostrum somewhat longer (the length of prothorax), somewhat narrowed to base, with the sculpture on the basal half less coarse.

Queensland: Longreach (A. M. Lea).

In general appearance like *H. cioniformis*, or small specimens of *H. nasutus*, but rostrum distinctly shorter in both sexes; *H. cionoides* is a darker species, also with longer rostrum. The scales on the pronotum are moderately dense, becoming denser on some irregular vittae; on the elytra they are absent from irregular patches, and in places appear as remnants of numerous irregular fasciae or as irregular rings about the punctures; they are denser and paler about the dark scutellar patch than elsewhere, but do not conspicuously encircle it. On one specimen the scales on the upper surface are almost entirely stramineous, on two others they are white on the pronotum and base of elytra.

A male from Northern Queensland (Blackburn's collection) has the pale ring around the scutellum more nearly complete, but in other respects is considerably abraded.

Haplonyx leucopholus, n. sp.

Reddish. Densely clothed with white scales, irregular on parts of elytra.

Rostrum slightly longer than prothorax, sides gently narrowed to base; with crowded confluent punctures on basal two-thirds, smaller and less confluent in front. Prothorax subconical, apex about half the width of base, densely granulate-punctate. Elytra cordate, base rather strongly trisinuate, outlines subcontinuous with those of prothorax; with rows of large rough punctures, in most parts partly concealed by clothing; interstices multigranulate. Legs moderately long, femora acutely dentate, each of the front ones with a small tooth in the notch; front tibiae evenly bisinuate on lower surface. Length, 6 mm.

North-western Australia: Leopold Downs (W. R. Richardson), unique.

The type is probably a female, and its rostrum is almost as long as on the male of *H. nasutus*. The clothing is entirely white, even on and about the scutellum, but the elytra, to the naked eye, appear to have two dark fasciae, owing to the partial absence of clothing. Some scales in the striae are placed singly and round, in contrast with the more or less setiform ones on the interstices. There is some pale meal on parts of the under surface.

Haplonyx serratipennis, n. sp.

Reddish. Moderately densely clothed with white scales, irregular on parts of elytra.

Rostrum the length of prothorax, sides slightly narrowed to base, with coarse confluent punctures, becoming smaller and more sharply defined in front. Prothorax strongly transverse, apex about two-thirds the width of base, densely granulate-punctate. Elytra cordate, base feebly sinuate; with rows of large rough punctures, the interstices multigranulate. Femora stout, strongly dentate, the front ones each with a small tooth in the notch; front tibiae moderately bisinuate. Length, 4·25-4·50 mm.

Western Queensland (Blackburn's collection).

The clothing is quite as pale as on the preceding species, but there are no round scales in the striae, and the rostrum and legs are shorter. Owing to the clothing being sparser on some parts than on others, there appear to be six feeble vittae on the pronotum, and two dark bands on the elytra. From some points of view granules on the elytra cause the margins to appear finely serrated throughout.

SIGASTUS FASCICULARIS, Pasc.

The claws on this species were described as soldered together at the base, but although this usually appears to be the case, on close examination they may sometimes be seen to be separated, although close together. The funicle is really seven-jointed, but the seventh joint is so closely applied to the club that, except for its different clothing, it appears to belong to it; the club is clothed with fine sensitised pubescence, which is replaced by setae on the joints of the funicle.

Sigastus tropicus, n. sp.

Black, parts of legs and antennae obscurely reddish. Densely clothed with variegated scales, and with some small black fascicles.

Rostrum straight, subquadrangular, the length of prothorax, with a marginal ridge on each side, from middle of eye to insertion of antennae, the space between with crowded squamiferous punctures, apex with naked punctures. Prothorax moderately transverse, subtubular in front, which is a little more than half the width of base; densely granulate-punctate. Elytra briefly subcordate, base trisinuate; with rows of large, deep, partially concealed punctures; interstices convex, the odd ones elevated above the even ones, all more or less densely granulate. Femora stout, strongly dentate, the front ones each with a small tooth in the notch; front tibiae strongly bisinuate on lower surface; each claw-joint with two small approximate claws. Length, 5-7 mm.

Northern Territory: Darwin (G. F. Hill). Queensland: Cairns district (A. M. Lea).

Decidedly shorter and with fewer fascicles than *S. fascicularis*, or *S. casuarinae*, the median projection of the front tibiae is also more distant from the apex. The claws are small and close together, but are not soldered at the base. The majority of scales on the upper surface of the type are fawn coloured, with short transverse fasciae of darker ones on the elytra; with two small dark spots on the head, and two more near the front of the pronotum, with white scales densely distributed; on the under surface they are mostly whitish, becoming fawn coloured on the sides of the sterna. The type has four fascicles on the pronotum, placed as on many species of *Haplonyx*, but the front ones are feeble; on each elytron there are two small fascicles on the third and fifth interstices, one on the shoulder, and feeble ones elsewhere. On a second specimen, from Darwin, there is a large triangular patch of mostly dark-brown scales at the base of the elytra, and more black marks on the pronotum, but the head is without black scales. The specimen from Cairns is smaller, of a dark reddish-brown,

with paler legs and antennae; its head has alternate vittae of dark-brown and pale scales; on its pronotum there are two conspicuous black fascicles, but no small apical ones (they were probably abraded, however, as the derm at their positions is naked); on the elytra the fascicles are more feeble, but placed as on the other specimens, and there is a large dark patch on each shoulder; its rostrum is entirely glabrous, but this is probably a feminine character.

CRYPTORHYNCHIDES.

Poropterus impendens, n. sp.

Pl. vii., figs. 3 and 4.

Black. Irregularly clothed with ashen-grey scales and setae.

Rostrum moderately curved; basal half with rows of punctures, becoming irregular in front. Antennae inserted about one-third from apex of rostrum, two basal joints of funicle elongate, first slightly longer than second. Prothorax about as long as wide, sides strongly rounded, with numerous large granules and with six tubercles: two elongated ones in front and four across middle, the median larger than the outer ones; with a short median carina. Scutellum absent. Elytra not much wider than prothorax at base, widest at about basal third, with a notch inwards of each shoulder for the reception of hind angle of prothorax; with irregular rows of large punctures; with numerous elevations, varying from large granules, to rather large rounded tubercles, the largest conical, and overhanging the apical slope. Legs long and thin, femora feebly dentate. Length, 13 mm.

New South Wales: Eccleston (J. Hopson), Barrington Tops (T. G. Sloane).

Allied to *P. succisus, nodosus, conifer,* and *corvus;* from the first two distinguished by the tubercles at summit of apical slope longer and closer together, with only one stria on each elytron traceable between them, instead of two on each; from *P. conifer* it is distinguished by numerous granules on the basal half of prothorax, and from *P. corvus* by the fewer tubercles on the elytra, their positions, and by the larger and more pointed ones overhanging the apical slope. Of the two specimens under examination one is almost completely abraded, and its small femoral teeth are fairly distinct, on the other the clothing is moderately dense and the teeth are almost concealed. The two largest tubercles are about half the length of the hind tibiae. There are ten round ones on the elytra: four across the basal fourth, four forming a curved median row, and two near the largest ones; some of the other elevations could fairly be regarded as small tubercles; the tips are also mucronate.

Poropterus griseus, n. sp.

Pl. vii., figs. 5 and 6.

Black, claws obscurely reddish. Densely but irregularly clothed with pale greyish-brown scales and setae.

Head somewhat flat and with small punctures. Rostrum about the length of prothorax, moderately curved, sides gently incurved to middle, with numerous small punctures. Prothorax almost as long as its median width, sides strongly rounded in middle, and deeply constricted near apex, the constriction interrupted in middle; with two fasciculate granules in front and four tubercles across middle, the median ones larger than the outer ones, with numerous granules. Scutellum small. Elytra slightly sinuous at base, which is but little wider than base of prothorax, sides evenly rounded to near apex and widest near middle; with rows of large deep punctures, interrupted in parts by tubercles; with rows of three tubercles on third and fifth interstices, and two smaller ones on seventh,

suture with numerous granules on basal third; the tips with two fasciculate granules or mucros. Legs long and thin, femora edentate. Length, 12-14 mm.

Tasmania: Cradle Mountain (H. J. Carter). Type, in National Museum; cotype, in South Australian Museum.

Allied to *P. succisus, simsoni,* and *corvus*. On *succisus* the subbasal and median tubercles of the elytra and those on the pronotum are much less conspicuous; on *corvus* the elytral tubercles are more numerous; on *simsoni* the large tubercles overhanging the apical slope when viewed from behind are seen to diverge slightly outwards from the line of the others on the third interstice, on all three specimens of the present species they are seen to be in exact lines with them; on *simsoni* there is also a distinct tubercle at the extreme base of the third interstice on each elytron, from the present species this is absent. The clothing on the legs is uniform, but on the upper surface is irregular in distribution. The two large median tubercles on the pronotum vary in rotundity; the prothoracic granules are dense on the sides, except at base and apex, on the upper surface they are dense only on the basal half. The tubercles on the third interstice are almost evenly spaced, but the third crowning the apical slope is more conical than the others, and usually larger; the tubercles on the fifth interstice are smaller than those on the third, and its first is more distant from the base and its third from the apex; the tubercles on the seventh interstice are still smaller, the first is nearest of all to the base and the second is almost level with the first on the fifth interstice; but the numbers of tubercles forming the rows on the fifth and seventh interstices are subject to variation. The base of the head is not entirely concealed by the prothorax, and is densely and finely transversely strigose, and obliquely punctured. The three specimens taken appear to be females.

Poropterus posterius, n. sp.

Pl. vii., figs. 1 and 2.

Black, antennae and claws obscurely reddish. Irregularly clothed with sooty-brown and greyish scales and setae.

Head with a conspicuous interocular impression. Rostrum moderately long and curved; with numerous punctures, partly concealed by scales. Prothorax slightly longer than wide, strongly rounded in middle, deeply constricted near apex, with two small fascicles at apex, and four tubercles across middle, the median ones larger than the others, with numerous large granules on basal half and on the sides; with a short median carina. Scutellum small. Elytra widest at about basal third, each side of base with a distinct notch for reception of hind angle of prothorax; with irregular rows of large punctures; third, fifth, and seventh interstices with rows of tubercles, but the largest of all at the junction of the third and fifth, crowning the apical slope, tips with two distinct tubercles; some distinct granules on the suture and elsewhere. Legs long and thin, femora edentate. Length, 10-11 mm.

Victoria: Alps (Rev. T. Blackburn), Ararat (H. W. Davey).

Allied to *P. simsoni,* of which at one time I considered it a variety, but distinguished by three distinct tubercles on the third interstice on each elytron, not counting the large one overhanging the apical slope, this being at the junction of the third and fifth interstices (and itself granulate), the granules on the suture are also larger, the largest being almost conjoined and just before the apical slope. The three specimens taken, apparently all males, agree in these details.

Poropterus angustus, n. sp.

Pl. vii., figs. 13 and 14.

♂. Black, claws reddish. Sparsely clothed with greyish setae, stouter, denser and paler on sides of mesosternum and metasternum.

Head flat and with a small fovea between eyes. Rostrum moderately curved, the length of prothorax, with numerous punctures in irregular rows behind antennae, more crowded and smaller in front. Antennae inserted about one-third from apex of rostrum, two basal joints of funicle elongate. Prothorax slightly longer than wide, sides strongly rounded in middle and deeply irregularly constricted near apex; with a curved row of four large rounded tubercles across middle, apex obtusely bituberculate, with a few large granules or small tubercles on basal half and on sides. Elytra very little wider than the widest part of prothorax, base widely trisinuate; with irregular rows of large deep punctures, in striae only near sides; with several obtuse granuliferous tubercles, and two large ones overhanging the apical slope, a few granules scattered about. Legs long and thin, femora minutely dentate. Length, 9-11 mm.

♀. Differs in having the rostrum longer, thinner, with smaller punctures; antennae inserted not as close to the apex of rostrum, elytra wider, and two basal segments of abdomen more convex.

Queensland: National Park (H. J. Carter and H. Hacker).

A narrow tuberculate species allied to *P. parvidens,* but median tubercles of pronotum smaller and the lateral ones larger, elytra less deep, with denser punctures, the largest tubercles nearer the apex, femora less clavate and with smaller teeth. Of the eight specimens taken three have the prothoracic tubercles obscurely diluted with red, and some have parts of the antennae and legs also obscurely reddish. The elytral interstices are not well marked except towards the sides, but on the approximate position of the third there are two tubercles, each somewhat smaller than the median ones on the pronotum, on the fifth there are two less distinct ones, but at the approximate position where the third and fifth interstices join is a very large one, more than twice the size of the median ones on the pronotum; the tips are also obtusely tuberculate.

Poropterus submaculatus, n. sp.

Pl. vii., figs. 10 and 11.

♂. Black, antennae and parts of tarsi reddish. Rather sparsely clothed, but legs densely setose.

Rostrum slightly shorter than prothorax, moderately curved, opaque and with seriate punctures on basal half, elsewhere shining and with smaller and denser but not seriate ones. Prothorax slightly longer than wide, sides rather strongly rounded in middle, and deeply constricted near apex, but not across middle, which is slightly concave and with two fasciculate projections in front; with large, scattered punctures; with four obtuse fasciculate tubercles across middle, the outer ones smaller than the inner; median carina short and obtuse. Scutellum absent. Elytra narrow and deep, the width of prothorax; with rows of large deep punctures, smaller near suture than elsewhere, third interstice on each elytron with two fasciculate tubercles, fifth with two smaller ones, their junction with a large one crowning the apical slope. Legs moderately long and stout, femora apparently edentate. Length, 7·5 mm.

Queensland: Mount Tambourine, in October (H. Hacker). Type, in Queensland Museum; cotype, in South Australian Museum.

In general appearance close to *P. ornaticollis,* but with two large tubercles crowning the apical slope; altogether there are five tubercles on each elytron (instead of six), and of these four are but slightly elevated, and indicated more by their clothing than size. *P. stenogaster,* which has somewhat similar large tubercles, is narrower, rather densely clothed, with much shorter and otherwise different legs, and differs in many other respects. The prothorax and elytra are much as in *P. maculatus,* and there are even remnants of the spots that are so conspicuous on that species, but the legs are decidedly shorter and stouter,

and the hind femora scarcely extend to the tip of the abdomen, on that species they considerably pass it. The elevated parts of the prothorax and elytra are feebly fasciculate, but the upper surface is otherwise almost glabrous. Some of the scales on and about the coxae and near the eyes are of a brick-red colour; on the lower part of the overhanging apex of prothorax there is a patch of stramineous scales. There is a fairly large notch on each side of the base of the elytra for the reception of the hind angle of the prothorax, but it is invisible from above. Seen from the side each elytron has seven rows of punctures (others near the suture are invisible from the side), of these the first is a short marginal row, the second is complete but curves upwards at the base, the seventh consists of three or four about the largest tubercle; this is clearly where the third and fifth interstices should join, although the series of punctures and their interstices are not well defined.

Poropterus sylvicola, n. sp.

Pl. vii., fig. 16.

♂. Black, antennae and parts of tarsi reddish. Densely clothed with greenish-grey scales interspersed with pale-brownish setae, and on the legs with black ones; with numerous pale-brown fascicles on the prothorax and elytra.

Rostrum stout and rather strongly curved; basal half opaque and with rows of partially concealed punctures, apical half shining and with dense punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides strongly rounded in middle and feebly constricted near apex, base trisinuate; punctures normally concealed; with six feeble elevations marked by conspicuous fascicles: two at apex and four across middle. Scutellum absent. Elytra at base, which is trisinuate, not much wider than base of prothorax, strongly dilated to beyond middle, and then coarctate to apex, which is quadrifasciculate, with rows of rather large punctures, partially concealed by scales, and interrupted by fasciculate tubercles, of which there are about twelve of varying sizes on each elytron. Two basal segments of abdomen gently depressed in middle. Femora stout and strongly dentate. Length, 11-13 mm.

♀. Differs in having the rostrum thinner, longer, clothed only near base, antennae inserted more distant from apex, and two basal segments of abdomen moderately convex.

Queensland: Mount Tambourine, in November (H. Hacker). Types, in Queensland Museum.

Apparently allied to *P. parryi*, although the femora are strongly dentate, a character which might be regarded as excluding the species from *Poropterus* itself. The forehead is feebly quadrisinuate, and has a rather acute median carina, but the latter is partially concealed by the scales. The scales on the female are less greenish than on the male, and are probably subject to alteration with age, as on other species having green scales on living specimens.

Poropterus cribratus, n. sp.

Pl. vii., fig. 12.

♂. Black, antennae and tarsi obscurely diluted with red. Clothed with obscurely variegated scales and setae.

Head with forehead sinuous, with a narrow median line. Rostrum rather strongly curved; basal half with dense concealed punctures, and a narrow median carina, apical half shining and densely punctate. Antennae inserted about two-fifths from apex of rostrum, two basal joints of funicle moderately long. Prothorax about as long as wide, sides moderately rounded in middle; with dense, large, round and deep punctures; with a short median ridge. Scutellum absent.

Elytra subparallel-sided, not much wider than prothorax; with rows of large punctures, mostly larger than those of prothorax; suture depressed at base, third interstice gently elevated; with numerous small black fascicles, and an elongate one at summit of apical slope. Basal segment of abdomen flat in middle, slightly longer than the three following ones combined. Legs moderately long, femora conspicuously grooved and feebly dentate. Length, 12 mm.

Queensland: Mount Tambourine, in December (H. Hacker). Type, in Queensland Museum.

The femora are grooved and dentate, aberrant characters in the genus, but at first glance the species appears to be allied to *P. morbillosus* and *P. orthodoxus,* although the punctures and forehead are very different. The majority of scales and setae on the upper surface are black, with sparsely distributed ones varying from small and almost white, to larger brick-red ones, on the legs they are mostly of a dingy-brown, on the basal segment of abdomen there is a conspicuous pale pad (probably confined to the male). The prothorax is without distinct fascicles or tubercles.

Poropterus setipes, n. sp.

Pl. vii., figs. 7 and 8.

♂. Black, antennae and parts of tarsi reddish. Densely clothed with almost uniform muddy-brown scales and setae, the latter dense on the legs.

Rostrum moderately stout and curved, apical third opaque and with crowded punctures, elsewhere punctures concealed by clothing. Antennae inserted about two-fifths from apex of rostrum, first joint of funicle distinctly longer than second. Prothorax slightly wider than long, sides strongly rounded in middle; with crowded concealed punctures, and a short median ridge; with numerous stiff setae, of which some form two feeble fascicles at apex, and four across middle. Elytra multisinuate at base, which is but little wider than base of prothorax, sides dilated to beyond middle, and thence coarctate to apex; with regular rows of large deep punctures; in places partially concealed by clothing; third interstice with two small but fasciculate tubercles, the first at basal fourth, the other crowning the long apical slope; fifth interstice with two less distinct tubercles. Two basal segments of abdomen large and feebly depressed in middle. Femora rather stout and apparently edentate. Length, 4-5 mm.

♀. Differs in having the rostrum longer, thinner, with smaller punctures, clothed only close to base, antennae inserted less close to apex, and two basal segments of abdomen gently convex.

New South Wales: Upper Williams River, in October (F. E. Wilson and A. M. Lea).

An unusually small species of the genus, apparently an aberrant member of the *lithodermus* group; *P. foveatus,* of that group, is very little larger, but has somewhat paler (brighter brown) clothing, longer legs, and distinctive abdominal punctures. It is about the size of *P. crassipes,* but the basal segment of the abdomen is not foveate. The numerous large stout setae on the legs, and especially on the tibiae, give them a curiously rough appearance.

Poropterus basalis, n. sp.

Pl. vii., fig. 15.

♂. Black, antennae and tarsi reddish. Densely clothed with blackish scales and setae, becoming obscurely paler on apical slope of elytra, and on parts of under surface and legs.

Rostrum moderately curved, about the length of prothorax; with crowded punctures, distinct on apical half, concealed by clothing elsewhere. Antennae inserted one-third from apex of rostrum, two basal joints of funicle elongate.

Prothorax moderately transverse, sides strongly rounded in middle, and rather feebly constricted near apex (the constriction invisible from above); punctures normally concealed; with six feeble tubercles rendered fairly distinct by fascicles: two at apex and four across middle. Elytra with four conspicuous projections at base, which is no wider than widest part of prothorax, sides gently rounded to beyond the middle; with almost regular rows of large punctures, in parts obscured by clothing; third and fifth interstices in parts raised and fasciculate; suture slightly thickened on apical slope, with a few granules near base. Basal segment of abdomen gently depressed in middle, almost as long as the three following combined. Legs moderately stout, femora edentate. Length, 6·0-6·5 mm.

New South Wales: Mount Kosciusko, four males at 5,000 feet (Dr. E. W. Ferguson).

A small species, at first glance apparently belonging to the *lithodermus* group, but really nearer the Tasmanian *P. montanus* than any other; from that species it differs in being smaller, narrower, with the elytral fasciculate tubercles reduced in size, and the four projections at base conspicuous. *P. parallelus*, also from Mount Kosciusko, is a considerably larger species, with sparser fascicles, and *P. lissorhinus*, from the same mountain, has a conspicuous tubercle on each side of the scutellar region and its rostrum is longer. The scales on the apical slope of the elytra, although rather dark, are paler than the others on the elytra, and form a patch somewhat hexagonal in shape (as on *Brachyporopterus montanus)*, but the species is narrower than that one, and the fascicles are smaller. The forehead is raised above the parts in front of it, and almost glabrous, but when the insect is "set" it is concealed by the overlapping prothorax. The elevated parts of the third interstice support fascicles, of which there is an elongated one at base, a small one in middle, and a distinct one at summit of the apical slope; on the fifth interstice the fascicles are less distinct, there is one (or a small series) at base, a small one in middle, a rather elongate one before and a distinct one half-way down the apical slope. There are some setae at the tips of elytra, but they do not form distinct fascicles.

Poropterus cryptodermus, n. sp.

♂. Black, antennae and tarsi reddish. Densely clothed with dark-brown scales and setae.

Rostrum moderately curved, parallel-sided, apical fourth opaque and with crowded punctures, elsewhere densely squamose and setose. Antennae inserted about one-third from apex of rostrum. Prothorax distinctly transverse, sides strongly rounded in middle and constricted near apex; punctures normally entirely concealed. Elytra slightly dilated to beyond the middle and then coarctate to apex; with rows of large, round, deep punctures, partly concealed by clothing. Basal segment of abdomen almost as long as the three following combined. Femora rather stout, moderately grooved and edentate. Length, 5 mm.

New South Wales: Dorrigo (W. Heron), unique.

A small densely clothed species, apparently an aberrant member of the *lithodermus* group, but also aberrant in the genus, as the femora are grooved and the facets of the eyes larger than usual. The upper surface is really multi-fasciculate, but there are so many scattered erect setae, similar to those forming the fascicles, that the latter are somewhat obscured; on the pronotum there are ten (two at apex, four across middle, and four at base), on the elytra they are on the third, fifth, and seventh interstices, the more distinct ones being at the base, and on and about the apical slope, four of those at the base are darker than the others but not quite black. The outer interstice on each elytron is narrowly polished throughout, but this may be due to friction with the femora.

Poropterus obesus, n. sp.

♂. Black, antennae and tarsi reddish. Moderately clothed with variegated scales and setae.

Rostrum stout and slightly shorter than prothorax; apical half shining and with numerous punctures, basal half squamose. Antennae inserted slightly nearer base than apex of rostrum, two basal joints of funicle elongate. Prothorax distinctly transverse, sides strongly rounded, apex about half the width of base, with an incomplete median ridge; punctures large, crowded, and partly concealed. Elytra short, sides rounded and subcontinuous with those of prothorax, base with a distinct notch inwards of each shoulder which appears as a distinct tubercle; with irregular rows of large, round, deep punctures, the punctures in the rows more widely separated than the rows themselves. First segment of abdomen with a deep curved impression near base, and a short longitudinal one at middle of apex. Femora rather short and stout, feebly grooved and dentate. Length, 5 mm.

♀. Differs in having the rostrum somewhat longer and thinner, less of its base clothed, and antennae inserted slightly nearer the base.

Queensland: Mapleton, in November (H. Hacker). Types, in Queensland Museum.

A small wide species, with outlines much as on many species of *Decilaus*. It certainly looks out of place in *Poropterus*, but there is no other genus to which it can be referred, and the head, legs, and grooved abdomen are much as in *P. rubeter*. The middle and hind femora are feebly dentate, but each tooth appears to be the abrupt ending of a feeble ridge bounding a shallow groove, rather than a true isolated one. The facets of the eyes are rather large. The clothing varies from almost white, through brick-red to black; on slight elevations of the upper surface setae or scales of one colour are condensed together, but they do not form true fascicles; the clothing on the under surface is mostly brick-red, on the head it is brick-red and dark brown, the legs are annulated. Owing to the irregularity of the clothing much of the derm of the elytra is exposed, and is seen to be opaque and finely shagreened.

Poropterus ferrugineus, n. sp.

Pl. vii., fig. 9.

♀. Black, antennae and tarsi reddish. Densely clothed with dark rusty-brown scales and setae.

Rostrum moderately long and curved, clothed only near base; elsewhere shining and with distinct punctures. Antennae inserted about one-third from apex of rostrum, two basal joints of funicle elongate, second slightly longer and thinner than first. Prothorax moderately transverse, sides strongly rounded in middle; with numerous large, partially concealed punctures; with a distinct but incomplete median carina; with six feeble elevations supporting feeble fascicles: two at apex and four across middle. Scutellum small. Elytra rather short and cordate, sides strongly rounded and widest just before middle; with rows of large, round, deep punctures; interstices in parts feebly elevated and fasciculate; shoulders notched for reception of hind angles of prothorax. Metasternum and two basal segments of abdomen with large round punctures. Femora moderately stout, slightly grooved and edentate. Length, 7 mm.

New South Wales: Tweed River (H. W. Brown), Dorrigo (Dr. R. J. Tillyard).

At first glance apparently belonging to the *lithodermus* group, but the presence of a distinct scutellum associates the species with *P. antiquus*, from which and all its allies it is distinguished by its more robust form; it is the first of the group to be recorded from the mainland. The third interstice at the base of

each elytron is curved outwards, to appear as a tubercular swelling inwards of the humeral notch, on and about the summit of the apical slope it and the others have feeble swellings, on which are fascicles, but the latter are rather feeble, partly owing to looseness of compaction, and partly owing to the abundance of scattered setae.

Poropterus punctipennis, n. sp.

♂. Black, antennae and tarsi obscurely diluted with red. Moderately clothed with rusty-brown and sooty scales, closely applied to derm, and becoming denser on under surface and legs.

Rostrum moderately stout, slightly curved; opaque and with coarse punctures, partly concealed only near base. Antennae inserted one-third from apex of rostrum, two basal joints of funicle moderately long. Prothorax rather flat, base almost truncate, sides rounded and widest slightly in front of middle, apex about half the width of base, with a feeble remnant of a median ridge; punctures small, rather sparse, and each concealed by a scale. Scutellum absent. Elytra rather long, shoulders clasping base of prothorax; with rows of very large punctures or foveae, not close together, but in places subconfluent. Under surface with fairly large punctures but nowhere foveate. Femora stout, edentate, middle and hind ones feebly grooved. Length, 11 mm.

New South Wales: Port Macquarie, in April (H. J. Carter), unique.

At first glance the type appears to be an abraded specimen of the *lithodermus* group, but it is not at all abraded. By its prothorax it seems intermediate between the *lithodermus* and *exitiosus* groups; it is narrower than any species of the latter group, and the elytra are not truly tuberculate, but the punctures are so large that the intervals between them have a subtuberculate appearance; the prothorax is wider and flatter than any species of the former group. Most of the large elytral punctures have a subtriangular appearance, deep at the base, and narrowly open posteriorly, they are in rows both longitudinally and obliquely, the only comparatively small punctures are on the apical slope. The scales of one colour, although not dense or forming fascicles, are more or less close together so as to form feeble spots, to the naked eye the upper surface (which is opaque and finely shagreened) has a uniform dingy-black appearance.

Poropterus pictus, n. sp.

Pl. vii., figs. 17 and 18.

♂. Black, antennae and tarsi reddish. Densely clothed with variegated scales and setae.

Rostrum almost the length of prothorax; opaque and rather densely punctate almost to tip, but punctures more or less concealed. Antennae inserted about one-third from apex of rostrum, second joint of funicle slightly longer and thinner than first. Prothorax slightly longer than wide, sides rounded and widest in middle, and narrowly constricted near apex; with large, round, partially concealed punctures; and with feeble elevations supporting fascicles: two at apex and four across middle. Scutellum absent. Elytra scarcely wider than prothorax at base, sides moderately dilated to beyond the middle; with regular rows of large punctures; the odd interstices, some of which are slightly elevated, with numerous setae, in places forming feeble fascicles. Abdomen with rather large, but partially concealed punctures, first segment as long as second and third combined. Femora moderately stout, neither grooved nor dentate. Length, 9-10 mm.

♀. Differs in having the rostrum slightly longer and thinner, with smaller punctures, clothed for a shorter distance, antennae inserted two-fifths from apex of rostrum, and two basal segments of abdomen moderately convex instead of flat.

Lord Howe Island, four specimens (A. M. Lea).

A brightly coloured species of the *lithodermus* group, and the first of the genus to be recorded from the island. The majority of the scales are of a pale rusty-brown or fawn colour, with paler (almost stramineous) ones forming a median vitta (dilated in the middle) on the pronotum, and two less defined ones on each side, on each elytron they form a curved mark from the shoulder to the third interstice at the basal third; blackish scales form four short basal vittae on the pronotum, two short ones on each elytron (one at the side of the pale humeral patch has a velvety appearance) and an irregular oblique postmedian vitta, or series of spots; on the apical slope the three shades of colour are irregularly mixed; on the legs the clothing is in alternate bands. The under surface of the front tibiae of the male is more densely setose than that of the female. On two specimens, probably from immaturity, parts of the derm are reddish.

Poropterus bituberculatus, Lea.

There are in the National Museum ten specimens taken at Harrietville (Victoria), in January, 1920, by Mr. J. E. Dixon, that I cannot satisfy myself belong to more than one species; their clothing differs slightly *inter se,* but apparently partly from abrasion. Of these specimens three have the typical basal tubercles of *P. bituberculatus,* and otherwise agree with the type; one has a few small shining granules on each side of the suture at base; and six have neither granules nor tubercles at the base of the suture.

Poropterus corvus, Lea.

Pl. ix., fig. 50.

The type of this species is evidently abraded. A specimen recently taken on the Upper Williams River (New South Wales) is in perfect condition. It is rather densly clothed (sparsely on the tubercles and granules) with brown scales. The species is rather close to *P. simsoni,* but may be distinguished by the large subbasal tubercles of the elytra. On this species at the position of the fifth interstice on each elytron, there is a rather large tubercle at the base, the next large tubercle is behind it, on the third interstice. On *simsoni* the first large one is on the third interstice near the base, the next large one being behind it on the fifth.

Poropterus crassipes, Lea.

On the abdomen of the type of this species the clothing is almost entirely black; on two specimens recently taken at Mallacoota Inlet (Victoria), it is conspicuously variegated with brown, and very pale buff (almost white), the latter very conspicuously on the sides of the third and fourth segments, and the base of the fifth. The marginal interstice on each elytron is polished throughout, as it is on the type, but it was not previously commented upon, as it was thought to be due to friction with the femora.

Poropterus flexuosus, Pasc.

Pl. ix., fig. 54.

A specimen from Hall's Gap in the Grampians (Victoria) differs from Kangaroo Island ones in having the elytral tubercles larger, and the ridges connecting those at the summit of the apical slope, and the apical ones, more strongly elevated.

Poropterus intermedius, Lea.

Pl. ix., fig. 51.

A specimen of this species from Bowen (Queensland) is unusually small (13 mm.)

POROPTERUS INUSITATUS, Lea.

The locality of the type was uncertain. Mr. H. J. Carter has taken a specimen at Barrington Tops (New South Wales).

POROPTERUS MORBILLOSUS, Pasc.

Pl. ix., fig. 36.

A specimen from the Macpherson Range appears to belong to this species, but has much smaller scales than usual, and they are pressed close to the derm, instead of being slightly elevated above it.

POROPTERUS RHYTICEPHALUS, Lea.

Pl. viii., fig. 29.

Mr. H. J. Carter received a specimen of this species from Mayemup. It is the first of the genus to be recorded from Western Australia.

POROPTERUS ALBOSCUTELLATUS, Lea.
Pl. viii., fig. 23.

P. ANGUSTATUS, Lea.
Pl. ix., fig. 47.

P. ASTHENIATUS, Lea.
Pl. viii., fig. 32.

P. BASIPENNIS, Lea.
Pl. ix., fig. 40.

P. CARINICOLLIS, Lea.
Pl. viii., fig. 33.

P. CHEVROLATI, Waterh.
Pl. viii., fig. 27.

P. CONIFER, Boh.
Pl. viii., fig. 24; pl. ix., fig. 46.

P. CONSTRICTIFRONS, Lea.
Pl. ix., fig. 53.

P. CONVEXUS, Lea.
Pl. ix., fig. 44.

P. CORVUS, Lea.
Pl. ix., fig. 50.

P. ELLIPTICUS, Pasc.
Pl. viii., fig. 20; pl. ix., fig. 49.

P. FASCICULATUS, Lea.
Pl. ix., fig. 43.

P. FLEXUOSUS, Pasc.
Pl. ix., fig. 54.

P. HUMERALIS, Lea.
Plate ix., fig. 38.

P. IDOLUS, Lea.
Pl. viii., fig. 22.

P. INTERMEDIUS, Lea.
Pl. viii., fig. 32.

POROPTERUS JEKELI, Waterh.
Pl. viii., fig. 28.

P. LONGIPES, Lea.
Pl. ix., fig. 37.

P. MORBILLOSUS, Pasc.
Pl. ix., fig. 36.

P. PARALLELUS, Lea.
Pl. ix., fig. 39.

P. PARRYI, Waterh.
Pl. viii., fig. 26.

P. PARVIDENS, Lea.
Pl. ix., fig. 42.

P. PYTHON, Pasc.
Pl. ix., fig. 35.

P. RHYTICEPHALUS, Lea.
Pl. viii., fig. 29.

P. RUBUS, Pasc.
Pl. viii., fig. 31; pl. ix., fig. 45.

P. SIMSONI, Lea.
Pl. viii., fig. 30.

P. SPHACELATUS, Pasc.
Pl. viii., fig. 21.

P. SUCCISUS, Er.
Pl. viii., fig. 34; pl. ix., fig. 48.

P. VARIABILIS, Lea.
Pl. viii., fig. 25.

P. VERRES, Pasc.
Pl. ix., fig. 41.

P. WATERHOUSEI, Pasc.
Pl. viii., fig. 19.

Figures of these species, not previously illustrated, are given for purposes of comparison.

PSEPHOLAX PASCOEI, Oll.

Pl. ix., figs. 55 and 56.

The type of this species was evidently a male in good condition (at least as regards its clothing). On rubbed specimens the "small patch of yellowish scales at the base" of the prothorax is often missing, and the "long fulvous

pubescence" on the side of each elytron is dense on specimens in good condition but is often abraded on others; the third interstice on each elytron is much wider than the adjacent ones at the summit of the apical slope, but the five apical striae on each side of the suture, and their interstices, abruptly end some distance from the apex, the surface there being like two large obtuse tubercles. The clothing of the first, third, and fifth interstices beyond the middle is more or less brown, rather than black. The basal segment of the abdomen ends in a very conspicuous fringe, which overhangs the second segment, the latter having its middle triangularly produced forwards under the overhanging part, so that its length along the middle is more than twice that of the first.

The female differs from the male in having the front of the head and most of the rostrum densely clothed with short erect bristles, the elytra not transversely impressed near the base, the granules there much smaller and more numerous, the striae and interstices continuous to the apex, the clothing on the sides much shorter and stouter, the abdomen without a conspicuous fringe at the apex of the first segment, which does not overhang the second, is slightly longer than it, and has finer punctures, the hind legs are shorter and thinner, and the femora are very sparsely clothed.

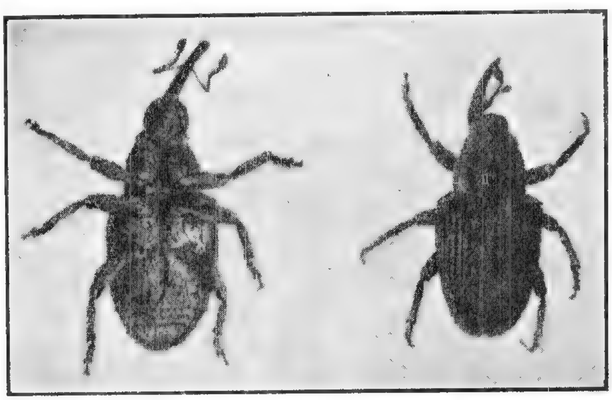
Fifteen males but only one female were obtained at a sawmill, where some logs of the Norfolk Island pine were being cut up.

Cisowhitea.

The acquisition of two new species of this interesting genus has convinced me that its true position is amongst the allies of *Melanterius,* and consequently that it forms one of the chain of genera connecting the Cryptorhynchides with the Erirhinides. The typical species, *C. longicollis,* was not dissected to see if wings were present, but they certainly are on the two following ones.

Cisowhitea intermixta, n. sp.

♂. Black, most of rostrum and of antennae reddish. Densely clothed with whitish-grey and sooty-brown scales, becoming white on under surface of body and of legs; in addition with rather short, sloping setae, numerous on prothorax, forming single lines on the elytral interstices.



Cisowhitea intermixta, Lea.

Rostrum rather long, thin, and moderately curved; basal half with derm concealed by clothing, elsewhere shining and with minute punctures. Antennae inserted in middle of sides of rostrum, first joint of funicle long and dilated to

apex. Prothorax slightly longer than the basal width, which is about twice that of apex, sides feebly rounded; with crowded, normally entirely concealed punctures. Elytra elongate-cordate, conspicuously wider than prothorax, sides not quite parallel to beyond the middle; striate-punctate, the striae fairly distinct through clothing, but the punctures normally quite concealed. Metasternum scarcely notched in front; two basal segments of abdomen slightly flattened in middle. Length, 2·0-2·2 mm.

♀. Differs in having the rostrum distinctly longer, thinner, and more curved, its tip received in a deep notch in the front part of the metasternum, less of its base clothed, antennae inserted somewhat nearer base than apex, and two basal segments of abdomen evenly convex.

South Australia: Parachilna, abundant (E. L. Savage), Quorn (A. H. Elston).

In general appearance like *C. longicollis* on a reduced scale, but with shorter prothorax, and more curved rostrum. The base of the rostrum (normally concealed) and its apex are blackish, the club and some of the preceding joints are deeply infuscated. The disposition of scales on the upper surface varies somewhat, as also their contrasted shades, on some specimens some of the darker ones being of a rather deep black and the paler ones almost pure white, but they are mostly of a sooty-brown and whitish-grey, less sharply contrasted on the head and rostrum than elsewhere. On the pronotum a dark patch occupies the median half from base to apex, but the patch is often mottled, the paler side scales are also sometimes faintly mottled. On the elytra scarcely two specimens are exactly alike, the dark scales are very irregularly distributed, and are sometimes in large areas, in addition to small spots; there appears to be always a short pale vitta on the third interstice at the base, and usually a less distinct one on the fifth, the interspaces being sooty. Many of the setae, being snowy-white, add to the speckled appearance.

Two specimens, from Hughes (A. M. Lea), may represent a variety; they have the dark median patch on the pronotum reduced in size and the dark markings on the elytra almost confined to an irregular dark triangle on each side at the basal third.

Cisowhitea marmorata, n. sp.

♂. Black, rostrum and antennae reddish. Densely clothed with white scales mottled with sooty-brown on the upper surface; in addition with numerous short setae, mostly white, and on the elytra confined to a single row on each interstice.

Rostrum thin, curved, about the length of prothorax, apical half glabrous. Antennae inserted in middle of sides of rostrum. Prothorax about as long as the basal width, which is about once and one-half that of apex, sides gently rounded. Elytra oblong-cordate, not much wider than base of prothorax. Metasternum slightly notched in front. Length, 2 mm.

Queensland: Longreach, two males (A. M. Lea).

Considerably smaller than *C. longicollis*, and with prothorax shorter; it also differs from the preceding species in its prothorax being slightly shorter and the elytra wider and more parallel-sided. The scales on the rostrum are entirely white, on the pronotum the median patch occupies the same area as on the preceding species, but a median line and two short basal vittae within it are of a deeper shade; on the elytra the irregularly distributed dark patches occupy about half of the surface, including a sooty spot in the scutellar region. The elytral striae are well defined, but their punctures and those on the pronotum are entirely concealed.

SUPPLEMENTARY DESCRIPTIONS OF CRYPTORHYNCHIDES.

[Read September 13, 1928.]

Melanterius incisus, n. sp.

♂. Black, antennae and tarsi red. Moderately clothed with thin white scales or depressed setae.

Head small, with crowded punctures. Eyes separated slightly more than width at base of rostrum. Rostrum long and thin, almost straight to insertion of antennae and then curved downwards; with crowded punctures of moderate size to near apex, when they become sparser and smaller, with a fine median ridge. Antennae thin, inserted about one-fifth from apex of rostrum. Prothorax moderately transverse, sides rounded and feebly dilated from base to near apex, and then strongly narrowed to apex itself; with crowded punctures. Elytra conspicuously wider than prothorax at base, parallel-sided to beyond the middle; with fairly large punctures, in rather deep striae; interstices wide, densely punctate, third and fifth slightly elevated posteriorly, third to seventh feebly ridged posteriorly, the following ones ridged to near base, but the ridges not visible from above. Under surface with crowded punctures, much as on prothorax. Basal segment of abdomen depressed in middle, second rather strongly convex, slightly longer than fifth, and about as long as third and fourth combined. Femora moderately stout, the front ones slightly, the others more strongly dentate; tibiae rather thin, front ones incurved on lower surface at apical two-fifths, middle ones gently bisinuate on lower surface, hind ones dilated from base and deeply notched near apex, the notch bounded posteriorly by a stramineous fascicle. Length, 5-6 mm.

♀. Differs in having the rostrum longer, thinner, evenly curved throughout, with small and sparse punctures, crowded only near base, antennae inserted not much nearer apex than base of rostrum, basal segment of abdomen evenly convex and tibiae simple.

Western Australia: Cue (H. W. Brown).

A somewhat aberrant species, but which would be equally aberrant if referred to *Diethusa,* although the punctures of the metasternal episterna are denser than is usual on *Melanterius.* It is very distinct from all others of the allied genera by the tibiae of the male. *M. niveodispersus,* also from Cue, and of which only the type (probably a female) is known, is a smaller species, with some of the elytral interstices acutely ridged. The two females before me have the derm (except for parts of the under surface) entirely reddish, but probably from immaturity; on one of the males the shoulders are reddish. The clothing is nowhere dense, on the elytra it is sublineate in arrangement.

Melanterius latus, n. sp.

♂. Deep shining black, antennae and claw joints reddish. Sparsely clothed.

Head with crowded but sharply defined punctures. Eyes lateral and widely separated. Rostrum long, thin, moderately curved, almost parallel-sided; with fairly dense punctures, coarse about base, then sublineate in arrangement to near apex, and irregular there. Antennae inserted about two-fifths from apex of rostrum. Prothorax subconical, at base much wider than long, sides rounded in middle; with crowded punctures, mostly obliquely confluent. Elytra cordate, not much longer than wide, sides and shoulders rounded; with rows of large, deep, semidouble punctures, becoming smaller and simple posteriorly; interstices acutely ridged, except near base. Pectoral canal deep and narrow in prosternum and mesosternum, and abruptly ended at metasternum. Metasternum with large punctures at sides, smaller (about as large as on prothorax) towards middle; each episternum with a row. Basal segment of abdomen evenly depressed in

middle; with large punctures (about as large as the larger ones on metasternum), second with somewhat smaller ones, fifth with still smaller crowded ones, third and fourth each with a row of minute ones across middle. Femora stout, front ones moderately dentate, the others more strongly so; tibiae arched at base, with seriate rows of punctures. Length, 5·0-5·5 mm.

♀. Differs in having the rostrum longer, thinner, with smaller and sparser punctures, pectoral canal continued on metasternum to abdomen (although dilated and shallower there), and basal segment of abdomen evenly convex.

Queensland: Kuranda (F. P. Dodd). Male, in South Australian Museum. Cairns (J. A. Anderson). Female, in Queensland Museum.

An unusually wide species, with the pectoral canal deeply impressed and on the male abruptly ended at the metasternum, but on the female dilated and continued (but shallower) to the abdomen. It is almost as wide as *Euthebus troglodytes*, but differs in many generic features from that species. In some lights the basal half of the elytra appears obscurely diluted with red. The upper surface at first glance appears to be glabrous, but there are some very minute and sparse setae on the elytral interstices, and in the prothoracic punctures, on the under surface and legs the setae are longer but still sparse. The prothorax has a fine median carina and appears to be multicarinate, owing to many of the punctures being obliquely confluent. The elytra are widest at the basal third, but as the shoulders are strongly rounded off the outlines of the prothorax and elytra appear subcontinuous.

Melanterius tibialis, n. sp.

♂. Blackish, some parts obscurely diluted with red. Moderately clothed with stramineous scales or setae, on the elytra condensed to form numerous small spots.

Head with rather small, crowded but sharply defined punctures, the base shagreened. Eyes lateral and widely separated. Rostrum parallel-sided, slightly curved, scarcely longer than prothorax; with rather coarse punctures, crowded about base, then sublineate in arrangement, becoming smaller and irregular about apex; with a feeble median ridge, and still more feeble ones on each side of it. Antennae inserted about one-third from apex of rostrum. Prothorax not much wider than long, sides feebly decreasing in width from base to near apex, and then rapidly to apex itself; with crowded punctures, many longitudinally or obliquely confluent. Elytra elongate, sides gently rounded and subcontinuous with those of prothorax, shoulders oblique; with rows of large punctures, partly concealed by clothing; interstices ridged, except close to base, the ridges acute posteriorly and on the sides. Under surface with crowded and mostly concealed punctures; each metasternal episternum with a single row. Second segment of abdomen about half the length of first, and slightly shorter than third and fourth combined. Front femora slightly, the others moderately dentate; tibiae compressed and with seriate rows of punctures, front ones strongly bisinuate on lower surface, the median projection conspicuous, apical hook rather long and acute, subapical tooth small and supporting a rather long fascicle; median tibiae less strongly bisinuate and with apical hook smaller; hind tibiae somewhat dilated at apex, and densely clothed there, the apical hook small, the subapical tooth almost concealed, and with a larger one projecting inwards. Length, 6 mm.

New South Wales: Bogan River (J. Armstrong), unique.

An elliptic species, in general appearance very close to *M. vinosus*, but readily distinguished by the tibiae of the male, especially by the supplementary subapical inner tooth. The clothing is denser on the metasternum than elsewhere. Owing to the confluence of the punctures the prothorax appears to be covered with short oblique or longitudinal carinae. On the type the scutellum has a shining median ridge, but this may not be constant.

Melanterius squamipennis, n. sp.

♂. Black; rostrum, antennae, and legs obscurely reddish. Clothed with sooty-brown and whitish scales.

Head with crowded, partly concealed punctures. Eyes separated almost the width of base of rostrum. Rostrum slightly curved, scarcely longer than prothorax, very feebly dilated from base to insertion of antennae, and then parallel-sided; with fine ridges and seriate punctures on basal half, crowded elsewhere. Antennae inserted one-third from apex of rostrum, third to seventh joints of funicle transverse. Prothorax distinctly transverse, sides rounded, apex about half the width of base; with crowded, normally concealed punctures. Elytra elongate-cordate, parallel-sided to beyond the middle; with rows of rather large, suboblong, but partly concealed punctures; interstices not separately convex, and nowhere ridged. Under surface in most parts with rather dense, partly concealed punctures; each metasternal episternum with a single row. Basal segment of abdomen with a wide median depression, continued on to metasternum, second slightly longer than third and fourth combined. Femora rather stout, all acutely dentate, but teeth smaller on front pair than on the others. Length, 3·5-4·0 m.m.

♀. Differs in having rostrum slightly longer, thinner, with smaller punctures, and basal segment of abdomen evenly convex.

Queensland: Dalby (Mrs. F. H. Hobler).

The elytra rather densely clothed, and interstices nowhere ridged, are aberrant for the genus, but the species was not referred to *Diethusa,* as there is but a single row of punctures on each episternum, and the second segment of abdomen is comparatively large. The clothing to a certain extent is suggestive of that of *M. lamellatus,* but the size is much smaller and the elytral interstices are uniform. Each side of the metasternum between the coxae, from oblique directions, appears to be armed with a curved tooth. On some specimens the legs, except the tarsi, and the rostrum, are almost as dark as the body parts, on many of them the antennae are reddish, but the apical joints of the funicle are usually darker than the adjacent ones. On the elytra the clothing is denser than elsewhere, with the sooty scales in the majority, the whitish or greyish ones being in numerous small spots, often elongated; on the pronotum the paler scales are irregularly distributed, on the head they are densest between the eyes, on the under parts the clothing is almost entirely whitish.

On this and all the following species, up to and inclusive of *M. submaculatus,* the elytral interstices are flattened or rounded on the basal half of elytra, agreeing with the characters noted in the 1899 table of the genus,(1) on some of them no interstice is carinated even near the apex.

Melanterius insularis, n. sp.

♂. Blackish, rostrum, antennae, and legs more or less obscurely reddish. Clothed with sooty and whitish scales.

Rostrum moderately curved, about the length of prothorax; punctures mostly concealed by clothing on basal half, naked and fairly dense elsewhere. Antennae inserted slightly nearer apex than base of rostrum. Prothorax, elytra, and under surface as described in preceding species. Front femora feebly, the others more strongly and acutely dentate, tibiae rather thin. Length, 3 mm.

♀. Differs in having the rostrum thinner, with smaller and sparser punctures, antennae inserted slightly closer to base than to apex of rostrum, and basal segment of abdomen evenly convex.

Queensland: Stradbroke Island (H. J. Carter).

Close to the preceding species, but consistently smaller, rostrum (both sexes) thinner, and antennae of female inserted slightly closer to base than to apex of

(1) Lea, Proc. Linn. Soc. N.S. Wales, 1899, p. 545.

rostrum, and that of male only slightly in advance of the middle; the legs are thinner, and the femoral teeth smaller. There are three of the present species and sixteen of the former before me, and I should probably have regarded them as forms of one species, but for the distinct differences in the insertion of antennae. The clothing is much the same, except that on the elytra of the present species the whitish spots cover more of the surface.

Melanterius modestus, n. sp.

♀. Black, antennae and tarsi obscurely reddish. Moderately clothed with stramineous or whitish scales or setae.

Head with crowded and small punctures, becoming shagreened at base. Eyes separated almost the width of rostrum at base. Rostrum the length of prothorax, moderately curved; with fairly dense punctures, partly concealed near base. Antennae inserted one-third from apex of rostrum, five apical joints of funicle transverse. Prothorax moderately transverse, apex about half the width of base; with dense and not very large, partly concealed punctures, except on a narrow, shining median line. Elytra elongate-cordate, sides gently rounded, base feebly trisinuate and somewhat wider than prothorax; with rows of elongate punctures, the interstices densely punctate and not separately convex, except that the third and fifth are slightly elevated above the adjacent ones on the apical half. Under surface with punctures about as large as on pronotum, but more crowded on metasternum and apical segment of abdomen; each metasternal episternum with a single irregular row, but becoming crowded on anterior triangle. Two basal segments of abdomen rather strongly convex. Front femora moderately dentate, the others more strongly so. Length, 4 mm.

Queensland: Kuranda (F. P. Dodd).

An elliptic species, near the two preceding ones, but larger, elytral clothing sparser and less maculate, and third and fifth interstices slightly elevated above the adjoining ones. It is about the size, and at first glance much the appearance of *M. acaciae*, but the elytral interstices are nowhere ridged.

Melanterius arenaceus, n. sp.

♂. Piceous or blackish, some parts paler. Clothed with variegated scales.

Head with crowded concealed punctures. Rostrum about the length of prothorax, moderately curved, parallel-sided; with fine ridges alternated with rows of punctures on basal half, irregular elsewhere. Antennae inserted two-fifths from apex of rostrum, five apical joints of funicle transverse. Prothorax moderately transverse, apex about half the width of base; with crowded, partly concealed punctures. Elytra elongate-subcordate, sides behind shoulders parallel to beyond the middle; with rows of elongate, partly concealed punctures; interstices not separately convex and nowhere ridged. Under surface with crowded punctures; metasternal episterna each with a single row. Basal segment of abdomen rather shallowly concave in middle. Femora acutely dentate, the front ones less strongly than the others. Length, 3-4 mm.

South Australia: Gawler Ranges (Capt. S. A. White), Quorn (A. H. Elston).

Allied to *M. squamipennis* and *insularis*, but the elytral clothing more tessellate than maculate, and the colours less sharply contrasted. *M. hybridus* is a larger and wider species, with more strongly dentate femora. *M. impolitus* is somewhat similar, but the clothing is less dense, and the femoral dentition stronger. There is a minute granule on the fourth interstice at the basal fifth, but it could be easily overlooked. Of the three specimens before me the type is piceous, with the antennae reddish, the rostrum and legs being intermediate in colour; a second specimen from the Gawler Ranges is evidently immature, as its derm is entirely of a rather pale red, the antennae no darker than the adjacent parts. The

specimen from Quorn is almost black, with the rostrum, antennae, and claw joints obscurely diluted with red. The clothing on the elytra is denser than elsewhere, on the type it is stramineous and sooty-brown in about equal proportions, but the shades unevenly distributed, and with a tessellated appearance. The prothorax has a greyish appearance, but the dark scales are inconspicuous, on the under surface and legs the clothing is almost white, and it is very little darker on the head, where it is dense between the eyes. On the second specimen the sooty scales are more conspicuous, owing to the paler derm. On the Quorn one the paler scales on the elytra are more greyish than on the others, and less contrasted.

Melanterius rufirostris, n. sp.

♂. Black; rostrum and antennae reddish, legs darker. Moderately clothed with almost uniform ashen scales, becoming paler on under parts.

Head with crowded, concealed punctures. Eyes large, separated slightly less than width of rostrum at base. Rostrum thin, slightly longer than prothorax, moderately curved; with crowded, concealed punctures about base, elsewhere shining and with minute ones. Antennae inserted very little nearer apex than base of rostrum. Prothorax moderately transverse, sides rather strongly rounded; with rather dense punctures, traceable through clothing. Elytra rather narrow, parallel-sided to beyond the middle; with rows of large somewhat irregular punctures, partly concealed by clothing; interstices separately convex but not ridged posteriorly, conjointly convex on basal half. Under surface with crowded punctures, each metasternal episternum with a single but not sharply defined row. Basal segment of abdomen widely and shallowly concave in middle, second slightly longer than third and fourth combined. Legs moderately long, femora acutely dentate. Length, 3 mm.

♀. Differs in having rostrum slightly longer, antennae inserted nearer base than apex of rostrum, and abdomen evenly convex.

South Australia: Kingoonya (A. M. Lea), Quorn (A. H. Elston).

Slightly larger than *M. minor*, but differently clothed, prothorax wider at base, and rostrum longer, thinner, and red.

Melanterius graniventris, n. sp.

♂. Reddish, prothorax and under surface somewhat darker than other parts. Moderately clothed with whitish scales or depressed setae, on the elytra almost confined to two rows on each interstice.

Head with small, crowded punctures, and a small interocular fovea. Eyes separated the width of base of rostrum. Rostrum not very thin, parallel-sided, about the length of prothorax, moderately curved; with rather coarse crowded punctures about base, becoming smaller to apex. Antennae inserted about one-third from apex of rostrum. Prothorax distinctly transverse, apex about half the width of base; with crowded punctures, each containing a small scale. Elytra wider than prothorax, but with their outlines (owing to the rounding off of the shoulders) subcontinuous; with rows of deep punctures in well-defined striae; interstices flat and with crowded punctures on basal half, separately convex but scarcely ridged posteriorly. Under surface (including metasternal episterna) with crowded punctures. Basal segment of abdomen, along middle, almost the length of the three following ones combined, gently depressed in middle, apex with two granules or small tubercles, second segment as long as third and fourth combined. Legs comparatively short, front femora feebly, the others acutely dentate; tibiae scarcely flattened. Length, 3 mm.

South Australia: Murray River (H. S. Cope).

A small, comparatively robust species, the punctures of the metasternal episterna are somewhat crowded at the ends, but the species is referred to

Melanterius on account of its clothing and abdomen. The type may be immature, but the species should be distinct by the abdominal granules, although these are probably confined to the male. Owing to the double rows of scales some of the elytral interstices appear to be feebly ridged posteriorly, but true ridges are absent.

Melanterius oleosus, n. sp.

♂. Black or blackish, rostrum and legs obscurely diluted with red, antennae usually somewhat paler. Upper surface almost glabrous, under parts with sparse white clothing.

Head with small crowded punctures, becoming shagreened at base. Eyes separated distinctly less than width of rostrum at base. Rostrum thin, moderately curved, slightly longer than prothorax; with rather coarse punctures and a narrow median carina on basal half, then with small but rather sharply defined punctures. Antennae inserted just perceptibly nearer apex than base of rostrum. Prothorax subconical, apex less than half the width of base; with crowded, comparatively small punctures, except on a feeble shining median line. Elytra with sides subcontinuous with those of prothorax, shoulders rounded off; with comparatively small, deep punctures; interstices minutely punctate, not separately convex on basal half, the second to sixth more or less acutely ridged on apical half. Under surface with crowded punctures; metasternal episterna each with a single row. Basal segment of abdomen depressed along middle, and with sparser punctures there than on sides, second segment slightly shorter than fifth, and distinctly shorter than third and fourth combined. Front femora feebly, the others moderately dentate. Length, 3·5-4·0 mm.

♀. Differs in having the rostrum longer, thinner, with sparser and smaller punctures, antennae inserted nearer base than apex of rostrum, basal segment of abdomen evenly convex and tibiae somewhat shorter and stouter.

Victoria: (A. H. Elston), Sea Lake (J. C. Goudie). South Australia: (Blackburn's collection), Murray River (H. S. Cope), Owiendana (H. M. Hale and N. B. Tindale), Carribie (Tindale).

A rather dingy, elliptic species, about the size of *M. corosus* and *adipatus*, and with a similar oily appearance, but punctures in striae much smaller, prothorax with sides more rapidly narrowed to apex, and with smaller punctures. The metasternum is distinctly ridged between the middle and hind coxae, but the ridges do not support fascicles, as on the male of *M. pectoralis*. *M. aberrans* (with insertion of antennae nearer base than apex in the type and only known specimen) is a considerably larger species, with feeble spots on elytra. There are some minute scales about the sides and apex of elytra, and in the prothoracic punctures, but at first glance the upper surface appears to be glabrous.

Melanterius lateralis, n. sp.

♂. Black, antennae and tarsi reddish. Moderately clothed with short whitish scales or depressed setae, on the elytra confined to two almost regular rows on each interstice.

Head with crowded punctures. Eyes separated less than width of base of rostrum. Rostrum moderately curved, slightly longer than prothorax; with rows of punctures separated by fine ridges on basal half, elsewhere with small punctures. Antennae inserted about two-fifths from base of rostrum, five apical joints of funicle transverse. Prothorax distinctly transverse, sides feebly rounded on basal half, and then strongly narrowed to apex; with crowded, partly concealed punctures, except on a feeble shining median line. Elytra parallel-sided beyond shoulders (which are rounded off) to about apical third; with rows of deep but (for the genus) not very large punctures; interstices densely punctate, the third to sixth feebly ridged on apical slope, the seventh more distinctly to

about the middle, the eighth and ninth still more acutely, and almost to base. Under surface with crowded punctures. Metasternum with a deep, round, apical fovea. Basal segment of abdomen with a wide median depression from base to apex, second flattened in middle, slightly longer than third and fourth combined. Front femora moderately, the others strongly and acutely dentate; front tibiae feebly bisinuate on lower surface, the others still more feebly so. Length, 5 mm.

Western Australia (Blackburn's collection); unique.

At first glance somewhat like small *M. bicalcaratus,* with less sparse clothing, but elytral interstices flatter, front tibiae of male not bicalcarate at apex, and punctures of metasternal episterna not confined to a single row, except in middle. It is also like a small specimen of *M. incisus,* but all the tibiae are very different. From the sides the lateral interstices are seen to be rather acutely ridged, but from directly above the elytra appear to be without ridges.

Melanterius femoralis, n. sp.

♂. Blackish-brown, rostrum, antennae, and legs obscurely reddish. Moderately clothed with short white scales or setae, longer on the under surface than elsewhere, shorter and more or less seriate in arrangement on elytra.

Head shagreened and with small, crowded punctures; with a small inter-ocular impression. Eyes separated about the width of rostrum in middle. Rostrum rather thin, but somewhat dilated to base, moderately curved, distinctly longer than prothorax; with rather coarse punctures on sides near base, but small elsewhere; with a feeble median line on basal half. Antennae inserted two-fifths from apex of rostrum. Prothorax moderately transverse, sides gently rounded but decreasing in width from base to apex; with crowded punctures, but leaving a short, shining, median line. Elytra oblong-cordate, base gently trisinuate, shoulders rounded off; with rows of deep but not sharply defined punctures; interstices with crowded punctures, third and fifth slightly elevated on apical slope, third to sixth slightly ridged posteriorly, seventh more acutely ridged, and almost to base, eighth and ninth ridged near base and again near apex. Under surface with more or less crowded punctures; on the metasternal episterna dense at ends, but in a single row in middle. Basal segment of abdomen with a wide, shallow depression, slightly continued on to second. Femora edentate, tibiae rather thin, the front ones feebly bisinuate on lower surface. Length, 5 mm.

Western Australia: Ankertell (H. W. Brown); unique.

In general appearance strikingly like the preceding species, but each femur has a swelling only close to the subapical notch, on the preceding species the teeth are acute and sharply defined, the basal segment of abdomen has a wider and shallower depression, and the fovea at the apex of the metasternum is less conspicuous. From directly above no elytral interstice appears costate.

Melanterius rufus, n. sp.

Reddish, prothorax and parts of sterna paler. Moderately clothed with white setae, on the elytra very short and in two rows on each interstice.

Head with small, crowded, partly concealed punctures. Eyes separated slightly less than width of base of rostrum. Rostrum not very narrow, parallel-sided, gently curved, distinctly longer than prothorax; near base with crowded, partly concealed punctures, elsewhere fairly numerous and smaller but sharply defined. Antennae inserted one-third from apex of rostrum, five apical joints of funicle transverse. Prothorax small, almost twice as wide as long, apex slightly more than half the width of base; with crowded punctures, but leaving a feeble median line. Elytra much wider than prothorax, and five or six times as long; base (except at scutellum) truncate, sides almost parallel to beyond the

middle; with rows of comparatively small, deep punctures; interstices wide and with crowded punctures about base, becoming biseriate, separately rounded and some of them slightly ridged posteriorly, but nowhere sharply ridged. Metasternal episterna with crowded punctures at ends but not in middle. Two basal segments of abdomen large and convex, but the first flattened or gently concave in middle, punctures as large as on prothorax, but not crowded, second slightly longer than third and fourth combined. Femora moderately long, slightly dentate, front tibiae feebly bisinuate on lower surface, the others not at all. Length, 4·5 mm.

Western Australia: Cue (H. W. Brown).

A reddish species, with comparatively small, wide prothorax, and large elytra. The femoral teeth are small but fairly acute, and do not vary much on the different legs. On the narrower parts of the interstices the punctures are mostly in double or semidouble series, on the wider parts they are mostly crowded. Two specimens agree in all details of sculpture, and are possibly males, although the two basal segments of abdomen are rather too convex to be sure of this. A third specimen differs in having the rostrum longer, thinner, with smaller punctures, antennae inserted two-fifths from apex of rostrum, third and fifth interstices of elytra rather densely clothed, basal segment of abdomen more strongly and evenly convex, and scutellum glabrous (this may be due to abrasion, on the types it is rather densely clothed). If the third specimen belongs to the species, it is certainly a female, and the others males.

Melanterius microtrichius, n. sp.

♀. Black, shining; rostrum, antennae, and legs reddish. Under surface and legs with rather sparse, whitish clothing, upper surface very indistinctly clothed.

Head with small, crowded punctures, the base shagreened. Eyes separated slightly less than width of base of rostrum. Rostrum moderately thin and curved, slightly longer than prothorax; with crowded but not very large punctures on basal third, smaller and sparser elsewhere. Antennae inserted two-fifths from apex of rostrum. Prothorax moderately transverse, apex more than half the width of base; with crowded punctures. Elytra elongate-cordate, outlines subcontinuous with those of prothorax; with rows of suboblong punctures; interstices with fairly dense punctures about base, becoming seriate in arrangement posteriorly and on the sides, third to seventh becoming ridged from about the middle, the following ones almost from base. Under surface with punctures about as large as on prothorax, but less crowded; each metasternal episternum with a single row. Two basal segments of abdomen strongly convex, second about as long as fourth and fifth combined. Front femora slightly, middle moderately, hind ones more strongly dentate. Length, 4 mm.

Western Australia: Geraldton, in September (H. J. Carter).

An ordinary looking, elliptic species, fairly close to *M. acaciae*, but longer in proportion, acute ridges commencing more posteriorly, and more sparsely clothed. Of the species from Western Australia the nearest to it is *M. servulus*, which is consistently smaller, the female with a thinner rostrum, and antennae inserted slightly nearer its apex; *M. castaneus* and *M. compactus* are much wider species. It is much like *M. vulgivagus* (from Queensland and New South Wales), but on that species the elytral costae are acute and some of them commence quite close to the base. On two specimens the elytra are obscurely reddish, on another the legs (except the tarsi) are black. The elytra at first glance appear to be glabrous, but there are very minute setae in two rows on each interstice; on the prothorax there is a minute seta in each puncture. On one specimen there is a short and feeble median line on the pronotum, but from the others even

this is absent. The four specimens taken appear to be all females, although on two of them the basal segment of abdomen is flattened in the middle.

Melanterius humeralis, n. sp.

Black; rostrum, antennae, shoulders and legs red. Under surface and legs moderately clothed with white setae, a small seta in each prothoracic puncture, and each elytral interstice with two rows of very minute ones.

Head with crowded punctures. Eyes separated almost the width of rostrum at base. Rostrum rather thin, moderately curved, distinctly longer than prothorax; basal third with rather coarse, crowded punctures, but leaving a shining median line, which is traceable almost to apex, beyond middle with small but rather sharply defined punctures. Antennae inserted slightly nearer apex than base of rostrum; five apical joints of funicle transverse. Prothorax moderately transverse, apex about two-thirds the width of base; with dense but not confluent punctures. Elytra moderately long, outlines subcontinuous with those of prothorax; with rows of suboblong punctures; interstices densely granulate-punctate, second to fourth with ridges commencing beyond the middle, the others with ridges gradually becoming longer, till on the sides they commence quite close to the base. Under surface with punctures about as large as on prothorax, but less crowded, each metasternal episternum with crowded punctures at ends, but forming a single row in middle. Two basal segments of abdomen large, the first gently concave along middle. Femora rather stout, strongly and acutely dentate. Length, 4 mm.

South Australia: Parachilna (H. M. Hale); unique.

An ordinary looking species, but the ends of the metasternal episterna with crowded punctures distinguish from *M. tristis, interstitialis, servulus, biseriatus, solitus,* and similar species. On the elytra the shoulders are distinctly reddish, and most of the apical slope is obscurely diluted with red. At first glance the upper surface appears to be glabrous. The sex of the type is doubtful, by its abdomen only it would appear to be a male.

Melanterius cicatricosus, n. sp.

♂. Dark brown, some parts almost black, scape paler. Moderately clothed with whitish scales or setae, becoming variegated on elytra.

Head with crowded punctures, becoming shagreened at base. Rostrum rather thin and curved, slightly longer than prothorax; with crowded punctures almost to apex, but leaving a shining median line, very narrow at base, but somewhat dilated in front. Antennae inserted one-third from apex of rostrum. Prothorax moderately transverse, sides strongly rounded, apex less than half the width of base; with crowded, partly concealed punctures. Elytra oblong-cordate, decidedly wider than prothorax; with rows of deep, elongate punctures; interstices with crowded punctures, and second and third slightly ridged on apical slope, the others with ridges gradually lengthening till on the sides they begin almost at the base, fourth on each elytron with a glabrous, elevated, red spot, at about the basal fourth. Metasternum with crowded punctures, slightly larger than on prothorax, but episterna each with a single row of small ones. Basal segment of abdomen widely depressed in middle, with slightly larger punctures than on metasternum, but less crowded, second about as long as third and fourth combined. Front femora rather feebly, the others more strongly and acutely dentate. Length, 4 mm.

Queensland: Herberton in January (C. J. Wild). Type (unique), in Queensland Museum.

Each side of the metasternum between the middle and hind coxae is elevated and moderately clothed (somewhat as on the female of *M. pectoralis*),

but it differs from the male of that species in being much less densely clothed there, the prothorax and elytra with moderate clothing, and the subsutural interstices scarcely raised posteriorly. *M. cinnamomeus* and *solitus* are somewhat similar in general appearance, but have elytral interstices conspicuously ridged. The elytral scales are mostly whitish, but there are numerous small clusters of dark ones, which give the surface a somewhat spotted appearance. The scar-like spot on each elytron is distinct; similar but less conspicuous spots are to be seen on several other species.

Melanterius modicus, n. sp.

♂. Deep black; rostrum, antennae and claw joints obscurely reddish. Under surface and legs moderately clothed with white scales or setae, upper surface almost glabrous.

Head shagreened and with small crowded punctures in front. Eyes separated almost the width of rostrum. Rostrum moderately thin and curved, scarcely longer than prothorax; with crowded punctures, becoming sparser but still dense in front, and leaving a feeble, shining median line. Antennae inserted about two-fifths from apex of rostrum. Prothorax slightly transverse, sides feebly diminishing in width to near apex, and then suddenly to apex itself. Elytra elongate-cordate, distinctly wider than prothorax, but outlines subcontinuous; with deep punctures becoming smaller but more sharply defined posteriorly; interstices with crowded punctures about base, becoming smaller and subseriate in arrangement posteriorly, third ridged on apical half, the following ones with ridges lengthening, till on the sides they commence quite close to the base, fourth with a slight scar-like process at the basal fourth. Metasternal episterna each with a single row of punctures. Basal segment of abdomen with a shallow median depression, second slightly longer than third and fourth combined. Femora strongly and acutely dentate, the front ones less strongly than the others. Length, 3·8 mm.

Queensland: Thursday Island (C. T. McNamara); unique.

An elliptic species, in general appearance like small *M. strabonus*, but three interstices on each side of suture not ridged on basal third, and clothing even sparser. The fourth interstice on each elytron has a scar-like spot, less distinct than on *M. cicatricosus*, and from which it differs in many other respects. It is fairly close to *M. tristis*, but is darker, and the interstices are somewhat different. *M. confusus* has eyes closer together and more acute elytral costae. It is larger and darker than *M. interstitialis*, and the carination of the interstices is more acute. The flattening of the first two interstices on each side of the suture distinguishes from *M. vulgivagus*. It is more sparsely clothed than *M. maestus*, and the prothorax is more strongly dilated to the base.

Melanterius hypolissus, n. sp.

♀. Dull reddish-brown; head, rostrum (except apex) and club blackish. Moderately clothed with depressed white scales or setae, the elytra, in addition, with sloping ones.

Head with crowded, concealed punctures. Rostrum slightly longer than prothorax, thin, parallel-sided, moderately curved; with dense punctures at base and on sides near base, elsewhere shining and with minute punctures. Antennae thin, inserted two-fifths from apex of rostrum. Prothorax moderately transverse, sides rounded and decreasing in width from base to apex; with crowded, partly concealed punctures. Elytra oblong-cordate, conspicuously wider than prothorax, base feebly bisinuate; with rows of deep, partly concealed punctures, interstices nowhere ridged. Under surface with crowded punctures; each metasternal episternum with a single row in middle.

Two basal segments of abdomen evenly convex, second as long as third and fourth combined. Hind femora feebly dentate, the others edentate, each with a small, highly polished space on under surface, just before the subapical notch. Length, 4 mm.

New South Wales: Sydney, in November (G. E. Bryant); unique.

The upper surface is more densely clothed than on most species of *Melanterius*, but less densely than on *Diethusa*, it is referred to the former genus as the punctures of the episterna are in a single row in the middle, although more numerous at the ends. The polished space on each femur is a distinctive feature. The third tarsal joint is wider than usual.

Melanterius multimaculatus, n. sp.

Reddish, elytra blackish. Moderately clothed with whitish scales or setae, the elytra multimaculate.

Head with small, crowded punctures. Eyes large. Rostrum moderately thin and gently curved, slightly longer than prothorax; with dense punctures becoming smaller towards apex, but leaving a feeble median line on basal half. Prothorax moderately transverse, sides gently rounded, apex about two-thirds the width of base and narrowly polished; with crowded, partly concealed punctures. Elytra elongate-cordate, distinctly wider than prothorax; with rows of long, deep punctures, interstices with crowded, partly concealed ones, third and fifth slightly elevated above the adjacent ones, and feebly ridged except close to base, the lateral ones feebly ridged. Metasternal episterna each with a single row of punctures. Basal segment of abdomen large, evenly convex, second distinctly shorter than third and fourth combined. Front femora feebly, the others moderately dentate. Length, 3 mm.

Western Australia: Toodyay (J. Klem); unique.

An elliptic species, in general appearance like small *M. maculatus*, but elytral clothing shorter and more depressed, the spots sparser and slightly more distinct, shoulders not at all clasping prothorax, and eyes larger and separated about two-thirds the width of rostrum at base. The third and fifth interstices are rather feebly carinated towards, but not quite to the base, but as the first, second and fourth are not, it does not appear desirable to associate the species with those having most of the interstices carinated to base or almost so. From some directions the club appears distinctly paler than the funicle. The elytra have numerous whitish spots, many of which are transversely confluent, but in addition the surface is clothed with minute and darker scales, which cause the derm to appear greyish; the pronotum has a slightly maculate appearance. The type is probably a female.

Melanterius submaculatus, n. sp.

♂. Black, shining, antennae and parts of tarsi reddish. Elytra with stramineous scales, mostly condensed into numerous feeble spots; legs moderately clothed with whitish setae, elsewhere sparsely clothed.

Head with small, crowded punctures, the base shagreened. Eyes comparatively small and widely separated. Rostrum thin and moderately curved, slightly longer than prothorax; with crowded punctures and a feeble median ridge on basal half, elsewhere with smaller, naked punctures. Antennae inserted one-third from apex of rostrum. Prothorax rather small, moderately transverse, apex about half the width of base; with crowded punctures, in places feebly confluent. Elytra elongate-cordate, shoulders rounded off but slightly clasping prothorax; with rows of large, deep punctures, all interstices beyond the first acutely ridged almost to base. Metasternum depressed along middle, episterna each with a single row of punctures. Basal segment

of abdomen depressed along middle; base with rather coarse, crowded punctures, becoming smaller but quite as sharply defined elsewhere, second about as long as third and fourth combined, each of the latter with a single row of small punctures. All femora acutely dentate. Length, 3·3—3·6 mm.

♀. Differs in having the rostrum longer, thinner, more curved, with coarse punctures only near base, antennae inserted but slightly in advance of its middle and abdomen evenly convex.

Queensland: Stradbroke Island (H. J. Carter).

An elliptic species allied to *M. maculatus*, and about the same size, but consistently darker, elytral clothing sparser, the spots more loosely compacted, but (owing to the sparseness of the clothing elsewhere) more distinct, and rostrum (both sexes) longer and thinner. The spotting is intermediate between that of *M. maculatus* and *stenocnemis*, the latter species, however, differs in many other respects. On *M. aratus* there is a medio-basal spot on the pronotum. On several specimens there is a very feeble remnant of a median carina on the pronotum. Seen from behind the elytra appear truly cordate, but from directly above the shoulders are seen to be slightly advanced. Two specimens from Brisbane (Dr. A. J. Turner and Mrs. C. Lea) appear to belong to this species, but are slightly larger, the elytral spots less distinct (probably owing to abrasion) and the third and fifth interstices slightly elevated above the adjacent ones on the apical slope.

On this and all the following species the elytral interstices are "more or less carinate or triangularly raised on basal half" as noted in the previously quoted table.

Melanterius tropicus, n. sp.

Brownish-black, some parts obscurely diluted with red. Sparsely clothed.

Head with small punctures in front, becoming shagreened at base. Eyes comparatively small, separated slightly less than width of rostrum at base. Rostrum rather thin, parallel-sided, moderately curved, slightly longer than prothorax; with crowded punctures on basal half, becoming smaller and sparser in front. Antennae comparatively stout, inserted one-third from apex of rostrum; first joint of funicle not much longer than wide, all the others transverse. Prothorax not much wider than long, basal half parallel-sided, then narrowed to apex; with dense and rather small, non-confluent punctures. Elytra elongate-cordate, shoulders rounded off and not clasping prothorax, sides nowhere quite parallel; with rows of long, deep punctures; interstices ridged almost to extreme base, except the sutural one on each elytron, which is feebly ridged posteriorly. Metasternum with crowded punctures, about as large as on prothorax; each episternum with a row of comparatively small ones. Basal segment of abdomen flat in middle, punctures slightly larger than on metasternum, second as long as third and fourth combined, each of the latter with a row of punctures about as large as on second. Front and middle femora moderately, the hind ones more acutely dentate. Length, 3 mm.

Northern Territory: Groote Eylandt (N. B. Tindale); unique.

The funicle is much as on *M. laticornis*, with which species it agrees in many other respects, but its rostrum is distinctly thinner than on that species, and the prothoracic punctures are much smaller (only about half the size) and smaller than those on the basal segment of abdomen; on *laticornis* they are larger than on that segment; *M. minor* is another closely allied species, but is smaller and narrower, subopaque, and the ridge on the second interstice on each elytron is shorter and less distinct. Each puncture on the legs and under surface contains a small white seta, on the elytra they are much smaller, appearing as two rows of minute specks on each interstice, but at first the upper surface appears to be glabrous. The type is probably a female.

Melanterius setipennis, n. sp.

Piceous-brown, antennae and tarsi paler. Sparsely clothed with stramineous setae, on the elytra moderately long, and forming a single loose row on each interstice.

Head with crowded punctures. Eyes not very widely separated, both above and below. Rostrum gently curved, no longer than prothorax; with rows of punctures separated by ridges on basal two-thirds, thence with punctures only. Antennae inserted about one-third from apex of rostrum. Prothorax strongly convex, sides strongly rounded, apex less than half the width of base; with crowded punctures, in places slightly confluent. Elytra comparatively short; oblong-cordate, decidedly wider than prothorax, the basal angles of which are not clasped by the shoulders; with rows of long, deep punctures; second interstice feebly ridged at about basal third, and rather acutely about summit of apical slope, the following ones acutely ridged almost to base. Metasternal episterna each with a single row of punctures. Two basal segments of abdomen strongly convex in middle, the second slightly longer than third and fourth combined. Femora acutely dentate. Length, 3 mm.

Queensland: Cairns district (F. P. Dodd); unique.

A small and rather wide species, with unusual elytral clothing, and eyes rather closer together on under surface than usual, although not as close as on *Neomelanterius*. The mesosternal receptacle is depressed in the middle, with the sides upturned. The type appears to be a female, judging by the abdomen.

Melanterius latipennis, n. sp.

Black, parts of antennae and of tarsi obscurely reddish. Under surface and legs sparsely clothed, upper surface practically glabrous.

Head with crowded punctures, and a feeble interocular impression. Eyes separated almost the width of base of rostrum. Rostrum moderately thin and parallel-sided, gently curved, no longer than prothorax; with crowded punctures. Antennae inserted one-third from apex of rostrum, five apical joints of funicle transverse. Prothorax moderately transverse, sides decreasing in width from base to near apex, and then rapidly to apex itself; with crowded punctures. Elytra wide, subcordate, sides nowhere parallel; with long, deep punctures; second interstice with ridge commencing feebly near base, but acute posteriorly, the following ones with the acute portion of the ridge commencing nearer the base. Under surface with crowded punctures, but in a single row on each metasternal episternum, and on each of the third and fourth segments of abdomen (but crowded on sides); first segment flattened in middle, second slightly longer than third and fourth combined. Femora stout, comparatively slightly dentate. Length, 4 mm.

Western Australia: Geraldton (J. Clark); unique.

A rather wide species, with elytral outlines subcontinuous with those of prothorax. Not quite as wide as *M. compactus*, carination of elytral interstices pronounced in parts, a small interocular impression, eyes more distant from each other, and front tibiae different at apex; but the rostrum and antennae are much as on the female of that species. It is fairly close to *M. adipatus* and *corosus*, but the elytra are more conspicuously carinate on the apical slope. *M. servulus* is of about the same length and colour, but is of normal width. The subapical tooth of the front tibiae is very close to the apical hook, so that from some directions the tip appears finely bidentate, from other directions, however, it is invisible. From some directions the rostrum appears to be multilineate behind the antennae, this being due to confluence of the punctures, but from others the lined appearance is much

less distinct; on the pronotum there appear to be many short oblique lines, owing to the partial confluence of two or three punctures. The head and prothorax are conjointly subconical. The sex of the type is doubtful.

Melanterius labeculosus, n. sp.

♀. Black, rostrum and legs obscurely diluted with red, antennae paler. Rather densely clothed with white scales and setae, mixed with dark ones on the upper surface, where they have a speckled appearance. Eyes separated the width of base of rostrum. Rostrum thin, slightly longer than prothorax, evenly curved; with minute punctures almost throughout. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides gently rounded and decreasing in width from base to apex; with crowded, normally concealed punctures. Elytra subcordate, not much wider than prothorax, sides nowhere parallel, base gently trisinuate; with rows of large, partly concealed punctures; interstices densely punctate about base, the third, fifth and seventh becoming feebly ridged from about the middle, some of the following ones more acutely ridged, the ridges beginning nearer the base. Metasternal episterna each with a double row of punctures at the ends, single in the middle. Two basal segments of abdomen strongly convex, the second slightly shorter than third and fourth combined. Femora stout, strongly and acutely dentate, tibiae rather thin. Length, 4·5 mm.

New South Wales: Dubbo (J. Armstrong); unique.

A strongly dentate species. Regarding the elytral interstices as not triangularly elevated on the basal half, this species, in the 1899 table of the genus, could be associated with *M. floridus*, which is a slightly larger species, with sides of prothorax more strongly rounded and much of the clothing golden. But regarding them as carinated on the basal half, it could be associated with *M. maculatus*, which is a considerably narrower species. In appearance it is close to *M. cinnamomeus*, but the rostrum is thinner than on the female of that species, the basal segment of abdomen is more convex, and the scales or setae of the upper surface are longer. There are some small dark scales on the upper surface, but they so closely resemble the derm as to be practically invisible under a lens; the elytra appear to be speckled rather than multimaculate.

Melanterius caledonicus, n. sp.

♂. Blackish or dark brown, some parts obscurely diluted with red. Rather sparsely clothed with whitish setae on the elytra, forming two irregular rows on each interstice.

Head with small, crowded punctures, the base shagreened. Eyes lateral and widely separated. Rostrum moderately curved, the length of prothorax, sides feebly incurved between antennae and base; with crowded punctures, leaving a feeble median ridge behind antennae, smaller (but still crowded) and without a median ridge in front. Antennae inserted about one-third from apex of rostrum. Prothorax not much wider at base than median length, sides slightly rounded and almost evenly decreasing in width from base to apex; with crowded punctures. Elytra rather long, outlines subcontinuous with those of prothorax and nowhere parallel-sided; with rows of long, deep punctures; interstices with crowded punctures about base, second feebly ridged towards base, but acutely posteriorly, the following ones with acute portion commencing nearer the base. Metasternum with crowded punctures, but in a single row on each episternum. Abdomen with less crowded punctures than on metasternum, and very small and in a single row on third and fourth segments, basal segment widely and shallowly concave. Femora acutely dentate. Length, 4·5—5·0 mm.

♀. Differs in having the rostrum somewhat longer, less curved, thinner and with smaller punctures, antennae inserted about two-fifths from apex of rostrum, basal segment of abdomen evenly convex, and in the front tibiae.

New Caledonia: Noumea (A. M. Lea).

An elliptic species, close to *M. acaciae,* from Australia, but average size slightly larger, femoral dentition slightly smaller, and rostrum less acutely carinated. The prothorax, scutellum, suture, and parts of sterna are darker than the other parts, but on the nine specimens taken are never deep black, the antennae are not much paler than the legs. The elytral setae are not very long but are somewhat curved, and cause the surface to appear somewhat greyish. The head and prothorax are conjointly subconical. On the male the hook at the apex of each front tibia appears as a continuation of the tibia itself; on the female the hook begins at the upper edge of the apex, with a distinct notch between it and the lower apex.

Melanterius vinosus, Pasc.

A specimen from Kingoonya (South Australia) probably belongs to this species, but differs from normal ones in being smaller (5 mm.) and with sparser and more conspicuous spots on the elytra.

Melanterius cordipennis, Lea.

A specimen, from Cairns, is possibly a female of this species; it differs from the type in being deep black (parts of the appendages excepted), with the eyes scarcely as close together, and slightly wider near the shoulders. The type was probably immature, but several species vary in colour, even when mature.

Melanterius laticornis, Lea.

This species occurs in South Australia (Murray River, Corney Point, Mercunda) and Queensland (Bowen) as well as in New South Wales and Tasmania. Specimens have a curious oily appearance even when fresh. The types are black, but many South Australian specimens are of a more or less dingy reddish-brown. The sexes scarcely differ in the rostrum and antennae, but the basal segment of the abdomen of the female is evenly convex, instead of depressed in the middle as on the male.

Melanterius fasciculatus, Lea.

Several additional specimens of this species have been obtained at Townsville and Cairns. The female differs from the male in having the yellow fascicles of the trochanters reduced to two or three setae, the abdomen more convex, its apex without two special setae, the rostrum longer, thinner, noncarinate, with smaller punctures, and antennae inserted at a greater distance from the apex.

Melanterius maculatus, Lea.

A specimen from Owiendana (Flinders Ranges) appears to represent a variety of this species; it differs from the type in being mostly red, with the elytra deep black, and the spots of pale clothing more conspicuous than usual.

Melanterius legitimus, Lea.

Three specimens from New South Wales (Meadow Flat), and Tasmania (Mount Wellington and Launceston), probably belong to this species, but differ from the type in being larger (4·5—5·0 mm.); as, however, the ridges on the basal half of the elytra are lateral, the punctures in the striae large, and the femora bidentate, presumably they can only be regarded as varietal.

Melanterius apicalis, Lea.

No species has been described under this name, but it was used in error [2] for *M. bidentatus*, Lea.

Diethusa inconstans, n. sp.

♂. Reddish, club slightly darker. Densely clothed with variegated scales, becoming whitish on under parts.

Rostrum rather thin, slightly dilated towards base, moderately curved, slightly longer than prothorax, basal fourth squamose, elsewhere with naked and rather small, but sharply defined punctures. Antennae inserted two-fifths from apex of rostrum. Prothorax small, sides gently rounded but decreasing in width from base to apex. Elytra robust, much wider than prothorax, base strongly trisinuate; with rows of large punctures, appearing much smaller through clothing; interstices nowhere ridged. Mesosternal receptacle concave, the front angles conspicuously upturned. Basal segment of abdomen widely flattened in middle, second slightly shorter than fifth, and still shorter than third and fourth combined. Hind femora strongly, middle slightly dentate, the front ones edentate. Length, 3·8—4·2 mm.

♀. Differs in having the rostrum longer and thinner, less of the base clothed, the shining part with smaller punctures, antennae inserted one-third from base of rostrum, and basal segment of abdomen strongly convex in middle.

Western Australia: Cue and Ankertell (H. W. Brown).

In general appearance close to *D. parvicollis*, but slightly larger and front femora edentate. *D. picta*, to which it is also close, has all the femora edentate; *D. pallidicollis* has acutely dentate front femora. *D. inaequalis* and *silacea* have the rostrum very different. The scales on the upper surface are mostly of a rusty-brown, in some lights frequently with a brilliant golden gloss, and they are varied with white and sooty spots or irregular fasciae, scarcely alike on any two specimens. On the pronotum there are usually three snowy basal spots, of which the median one is narrow and sometimes appears as an almost continuous median vitta, the lateral spots are usually large and irregular, but only partly visible from above. On the elytra there is usually a very irregular median white fascia, or series of white spots, bounded in front and behind by still more irregular black fasciae, or series of spots, but both the black and white scales are often irregular, although to the naked eye their fasciate arrangement is often fairly distinct. On an occasional specimen white scales are almost absent from the upper surface and still more rarely the black spots are absent. The derm is densely and rather finely punctate, but the punctures are normally concealed by the clothing.

On this and all the following species, except *D. heterodoxa*, the metasternal episterna have crowded squamiferous punctures throughout, this character being almost the sole one by which the species of *Diethusa* may be distinguished with certainty from the more densely clothed ones of *Melanterius*. In general the surface is densely covered with concealed punctures, but, except those of the rostrum, they can seldom be usefully employed. There are always sexual differences in the apex of the front tibiae, and they have always been examined, but the differences are often so slight, that I have usually not described them.

Diethusa potens, n. sp.

♂. Reddish. Densely clothed with stramineous and rusty-brown or reddish scales, the latter often with a golden gloss.

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(2) Lea, Trans. Roy. Soc. S. Austr., 1913, p. 189.

Rostrum rather thin and curved, slightly longer than prothorax, basal half squamose and with a feeble median ridge, slightly narrowed from antennae to apex, and glabrous; with rather dense and small, but sharply defined punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax small and rather strongly convex, sides rounded and decreasing in width from base to apex. Elytra with outlines and punctures as described on the preceding species. Basal segment of abdomen with a wide and shallow median depression, continued on to metasternum; second segment not half the length of first, and about as long as third and fourth combined, fifth with a wide depression bounded by scaly ridges. Femora stout, strongly and acutely dentate. Length, 5-6 mm.

♀. Differs in having the rostrum longer, thinner, less of the base squamose, the glabrous portion with sparser and smaller punctures, antennae inserted slightly nearer base than apex of rostrum, and abdomen larger and more convex, with the basal segment flat in middle.

Western Australia: Cue (H. W. Brown).

A comparatively large, multimaculate species. Its size alone is sufficient to distinguish it from all previously described species except *D. amplicornis*, which is narrower, with the second segment of abdomen scarcely larger than the third or fourth. It is somewhat like *D. pretiosa* on a greatly enlarged scale. On the prothorax the paler scales form a median vitta and a transverse subapical fascia, with some spots at the base; on the elytra they form numerous small spots, in almost regular rows, mostly between the large seriate punctures, from eighty to one hundred on each elytron, but some of the lateral and subapical ones may be conjoined; on the under surface, of body and of legs, the scales are almost entirely stramineous or whitish, but they are darker on the side pieces of the mesosternum. Most of the punctures are normally concealed by the clothing. The depression on the apical segment of abdomen scarcely differs sexually.

Diethusa subsulfurea, n. sp.

♂. Reddish. Densely clothed with sulphur-coloured and stramineous scales, becoming white on under parts.

Rostrum moderately curved, slightly longer than prothorax, parallel-sided; with fine ridges and concealed punctures to antennae, narrowed in front, with naked punctures and a few lateral bristles. Antennae inserted about one-third from apex of rostrum. Prothorax and elytra with outlines and punctures as in preceding species, but the third, fifth, and seventh interstices slighty ridged beyond the middle, but not to apex. Basal segment of abdomen strongly convex, but sloping downwards to middle of base, second in middle about two-thirds the length of first, and the length of fifth, the latter with a large apical depression. Femora stout, front ones feebly, middle moderately, hind ones strongly dentate. Length, 3·5-4·0 mm.

♀. Differs in having the rostrum thinner, less of the base clothed, apex with smaller punctures, antennae inserted nearer the base of rostrum, femora less strongly dentate, and abdomen more evenly convex.

Western Australia: Cue (H. W. Brown).

With the general appearance of *D. sulfurea*, but rostrum decidedly longer and femora dentate. The general outlines are much as on *D. parvicollis*, but the clothing and rostrum are very different. The clothing is somewhat like that of *D. porphyrea*, but most of the elytral interstices are noncarinate. The spotting of the elytra is less conspicuous than on *D. majorina*, and the rostrum, sex for sex, is very different. The clothing of the upper surface is of two shades, but at first glance appears to be entirely yellowish; the stramineous scales form markings on the prothorax as on the preceding species, and spots as on its elytra, but they are fewer in number and less sharply defined. The mesosternal receptacle is flat and slightly emarginate in front, but the front angles are not upturned.

Diethusa filirostris, n. sp.

♀. Reddish. Rather densely clothed with stramineous scales, becoming white on under parts.

Rostrum thin, slightly longer than prothorax and distinctly curved; with concealed punctures only close to base, elsewhere shining and with minute ones. Antennae thin, inserted about two-fifths from apex of rostrum, first joint of funicle almost as long as three following combined. Prothorax moderately transverse, sides slightly narrowed from base to beyond the middle, and then strongly to apex, which is about half the width of base; with crowded, partly concealed punctures. Elytra oblong-cordate, base much wider than prothorax, and scarcely trisinuate, although the sutural notch is distinct; with rows of large, partly concealed punctures; third to fifth interstices feebly ridged beyond the middle, the following ones with more distinct ridges, and continued almost to base. Abdomen evenly convex, second segment about two-thirds the length of first, and slightly shorter than third and fourth combined. Femora rather stout, strongly and acutely dentate. Length, 4·0-4·5 mm.

Western Australia: Cue and Ankertell (H. W. Brown).

Close to *D. majorina*, but shoulders more rounded off, and not so much wider than prothorax, scutellum with conspicuous white clothing, and rostrum slightly shorter, thinner, and more curved. *D. amplipennis* has wider elytra, longer rostrum, and more strongly dentate femora. The elytra have a slightly spotted appearance, but their scales are uniformly coloured. The clothing is somewhat as on *D. inaequalis*, but that is a much wider species, with very different rostrum. At first glance it appears close to *Melanterius hypolissus*, but the metasternal episterna have the dense squamose punctures of *Diethusa*. From some directions there is seen to be a narrow, deep notch between the apex of the front tibiae and the apical hook, a character apparently almost confined to females of several species of the genus, and especially noticeable on *D. insignita*.

Diethusa setirostris, n. sp.

Reddish. Rather densely clothed with stramineous scales, variegated with white and sooty-brown on upper surface, white on under parts.

Rostrum thin, moderately curved, distinctly longer than prothorax, squamose only near base, elsewhere shining and with small punctures, and a few long subapical setae or bristles on sides. Antennae long and thin, inserted about one-third from apex of rostrum. Prothorax moderately transverse, apex about half the width of base; punctures normally concealed. Elytra comparatively long, parallel sided to beyond the middle, much wider than prothorax, base gently trisinuate; with rows of fairly large punctures, appearing smaller through clothing; interstices without ridges, except the ninth for about half its length. Abdomen with basal segment almost as long as second and third combined, with a wide, shallow, median depression, second as long as fifth (which has a deep apical depression) and shorter than third and fourth combined. Femora stout, strongly and acutely dentate; front tibiae with two apical hooks, one on the upper, the other on the lower surface. Length, 6 mm.

Western Australia: Cue (H. W. Brown); unique.

An unusually large species; *D. amplicornis* is the next largest described one, but has very different antennae and legs. The armature of the front tibiae seems to be of a feminine nature, but this is apparently negatived by the basal segment of abdomen and lateral bristles of rostrum. It is about the size and with the body parts much as on *Melanterius incisipes* (also from Cue); but the metasternal episterna have the dense squamose punctures of *Diethusa*. The scales on the upper surface are mostly stramineous; on the pronotum there are some white scales on the sides, and a large medioapical dark patch; on the elytra there

are numerous irregularly distributed dark spots, and some smaller and less conspicuous white ones.

Diethusa nigrirostris, n. sp.

♂. Black and dull red; antennae, club excepted, paler. With rather dense, white clothing.

Rostrum slightly longer than prothorax, thin and moderately curved; clothed only quite close to base, elsewhere shining and with sparse and minute punctures. Antennae thin, inserted slightly nearer base than apex of rostrum. Prothorax almost as long as the basal width, which is about twice that of apex; with crowded, partly concealed punctures. Elytra rather long, much wider than prothorax, sides feebly diminishing in width to beyond the middle; with rows of large, partly concealed punctures; interstices nowhere ridged. Two basal segments of abdomen large and evenly convex, second distinctly longer than third and fourth combined. Femora stout, neither grooved nor dentate. Length, 7 mm.

Western Australia: Cue (H. W. Brown).

A large species, which at one time I had mixed with the preceding one, but in addition to the differences in the colour and clothing (and other characters which are possibly sexual), the prothorax is distinctly longer (its base is scarcely if at all wider than the median length), the elytral interstices are nowhere ridged, the femora are edentate, and the front tibiae are very different at apex. On this species, on each front tibia, there is a subapical tooth, and an apical hook, both commencing on the lower surface; on the preceding species, there are two apical hooks, of which the lower one is a continuation of the tibia itself, and the upper one is separated from the tibia by a narrow triangular notch. On the type, the head between eyes, rostrum, prothorax, and parts of sterna and of legs are black, on a second specimen the prothorax is of a dull red; on each of them the rostrum is of a polished black.

Diethusa ferruginea, n. sp.

♂. Reddish, parts of sterna black, scutellum blackish. Densely clothed with rusty-red and stramineous scales.

Rostrum rather thin, evenly curved and slightly longer than prothorax, basal half with squamose, crowded punctures and feeble ridges, elsewhere with dense, naked punctures; parallel-sided to between antennae, which are inserted at apical third, thence slightly narrowed to apex, and with a few lateral bristles. Prothorax moderately transverse, sides subparallel to beyond the middle, and then rapidly narrowed to apex. Elytra short, nowhere quite parallel-sided, base trisinuate and much wider than prothorax; with rows of large punctures, appearing much smaller through clothing; interstices nowhere ridged. Basal segment of abdomen with a wide shallow depression, continued on to metasternum, second, along middle only, almost as long as third and fourth combined. Femora stout, the front ones moderately, the others strongly and acutely dentate. Length, 3·5-4·0 mm.

♀. Differs in having the rostrum thinner and more narrowed in front, less of the base clothed, naked punctures smaller and less crowded, antennae inserted two-fifths from apex of rostrum, and basal segment of abdomen strongly convex.

Western Australia: Three Springs (W. du Boulay), Kojarena (H. J. Carter).

A compact species, structurally close to *D. inconstans, potens,* etc., and with dense punctures similarly concealed by clothing. It is fairly close to *D. pallidicollis,* but with darker prothoracic clothing, the rostrum of the male, except for the apical bristles, is much the same, but that of the female has the apical, glabrous, subulate portion much shorter. On the female of *D. inaequalis* the subulate portion of the rostrum is also much longer and thinner, but on some specimens the clothing is much alike. On the type male the stramineous scales

form a median line on the prothorax, and fairly large, irregular areas on the sides and apex, on the elytra they are confined to the shoulders, but on the apical slope the rusty scales are diluted almost to stramineous, most of the scales on the under surface and legs have a reddish tinge, but on parts of the sterna they are almost white. On some other specimens most of the scales are of a darker red, but on all of them the pale median line on the pronotum is distinct; on one male the elytra have numerous small stramineous spots; on a female the elytral spots are less defined, and more or less transversely confluent.

Diethusa hypoleuca, n. sp.

♂. Reddish, parts of under surface blackish. Densely clothed with pale rusty-red and white scales.

Rostrum rather thin, moderately curved, slightly longer than prothorax, basal third with crowded, concealed punctures, elsewhere with rather dense but naked ones. Antennae inserted in middle of rostrum. Prothorax moderately transverse, sides slightly rounded and decreasing in width from base to apex. Elytra not very long, base gently trisinuate and much wider than prothorax; with comparatively small punctures, in narrow striae, appearing still narrower through clothing; interstices nowhere ridged, or even separately convex. Basal segment of abdomen flat in middle, second as long as third and fourth combined. Femora moderately stout and edentate. Length, 3·0-3·5 mm.

♀. Differs in having the rostrum longer, thinner, straight, except for a short basal curvature, only extreme base clothed, elsewhere more polished and with smaller and much sparser punctures, antennae inserted at basal fourth, and abdomen evenly convex.

Western Australia: Cue (H. W. Brown).

A rather small species, with edentate femora, clothing of upper surface of only two colours, and antennae inserted unusually close to base of rostrum in female. *D. inermis* is a slightly smaller, multimaculate species. Most of the scales on the prothorax are white, there is a fairly large median patch, on which they are of a rather pale rusty colour, and they are still paler on the head, scarcely more than stramineous; on each elytron there is a large patch, not quite touching the base, suture or side, and fading posteriorly; the clothing on the under parts is entirely white.

Diethusa subglobosa, n. sp.

♀. Reddish. Densely clothed with sooty scales, interspersed with small pale spots; under surface with sooty-brown scales mixed with whitish ones, but the latter dense on middle of metasternum and adjacent parts.

Rostrum slightly longer than prothorax, rather thin, moderately curved on basal half, straight in front; basal third with concealed punctures, and a feeble median ridge, elsewhere with small naked punctures. Antennae inserted about two-fifths from base of rostrum. Prothorax moderately transverse, sides gently rounded and decreasing in width from base to apex. Elytra briefly subcordate, base strongly trisinuate, and much wider than prothorax; with rows of almost concealed punctures; interstices nowhere ridged. Basal segment of abdomen strongly and evenly convex, second almost as long as third and fourth combined. Front femora feebly, the others strongly and acutely dentate. Length, 3 mm.

South Australia: Lucindale (F. Secker); unique.

A dark, subglobose species, allied to *D. funerea*, but smaller, elytra multimaculate, rostrum different and femora more strongly dentate. There are some obscurely defined spots on the sides of the prothorax, and a few rusty scales about the middle, on the elytra the spots are small, numerous, and mostly stramineous or whitish; they are most numerous on the apical slope, but the two largest, although still small ones, are close to the scutellum.

Diethusa bimaculiceps, n. sp.

Blackish; elytra, tip of rostrum, antennae, and legs more or less reddish. Densely clothed with whitish scales, variegated with darker ones on upper surface; the head with two small dark spots.

Rostrum moderately curved, the length of prothorax, sides feebly decreasing in width from base to apex, basal half with crowded, partly concealed punctures and feeble ridges, elsewhere with fairly dense and small naked punctures. Antennae inserted two-fifths from apex of rostrum. Prothorax moderately transverse, sides rounded and decreasing in width to apex, which is about two-thirds the width of base. Elytra short, sides rounded, base strongly trisinuate, and much wider than prothorax; with rows of distant punctures, in narrow striae; interstices nowhere ridged. Basal segment of abdomen strongly convex, but slightly flattened in middle, second slightly longer than third and fourth combined. Front and middle femora slightly, the hind ones more strongly dentate. Length, 4 mm.

South Australia: North Meklenburg, on *Eucalyptus leucoxylon*, in October (J. G. O. Tepper), Tumby (Blackburn's collection).

In size and general appearance near *D. mollis*, but middle femora slightly and front pair scarcely dentate, instead of acutely dentate; the clothing, also, is not quite the same. Structurally it is near *D. funerea*, but the clothing is very different. *D. majorina* and *blackburni* are narrower species, with femora strongly dentate. On the type there is a rather large, irregular, dark spot on the prothorax, on its elytra there are some irregular, transverse, dark spots, and some of the paler scales are slightly stained with brown; on the second specimen the transverse spots are larger and more numerous, and appear almost like five interrupted fasciae. The two specimens examined are probably females.

Diethusa cognata, n. sp.

♂. Blackish; elytra, rostrum, antennae, and legs reddish. Densely clothed with white scales, variegated on upper surface.

Rostrum moderately curved, the length of prothorax; on basal third with concealed punctures and a feeble median ridge, elsewhere with minute naked punctures; parallel-sided to antennae (which are inserted at apical two-fifths) and slightly narrowed in front of them. Basal segment of abdomen widely flattened in middle, second slightly longer than third and fourth combined. Front femora moderately, the others more strongly and acutely dentate. Length, 3·5 mm.

♀. Differs in having the rostrum slightly longer and thinner, less of the base clothed, antennae inserted slightly nearer its base than apex, and basal segment of abdomen strongly convex in middle.

South Australia: Murray Bridge and Port Lincoln (A. M. Lea).

A dingy species, in general appearance fairly close to the preceding one, but with all femora acutely dentate; the elytra are slightly longer and more parallel-sided, but otherwise their outlines and punctures, and those of the prothorax, are much the same. The clothing in some respects is like that of faded *D. majorina*, but the femora are much less strongly dentate, and the rostrum in front of the antennae is different. *D. mollis* has stronger dentition, a larger prothorax, and even less variegated clothing. *D. blackburni* is a larger species, with paler under surface and abdomen of male distinctive. On the type the scales on the prothorax and elytra are mostly white, with small ill-defined spots, appearing as rusty stains; on the Port Lincoln specimen the scales on the upper surface are mostly somewhat rusty (in some lights with a golden gloss), with whitish markings, on the elytra appearing like thin irregular fasciae.

Diethusa pallida, n. sp.

♂. Pale reddish. Densely clothed with stramineous scales, becoming white on under parts, elytra with inconspicuous white spots.

Rostrum thin, parallel-sided to near apex, gently curved, slightly longer than prothorax; basal three-fifths with crowded, concealed punctures, and a feeble median ridge, elsewhere shining and with small punctures. Antennae inserted two-fifths from apex of rostrum. Prothorax distinctly transverse, sides subparallel to near apex, which is about two-thirds the width of base. the latter straight. Elytra rather long, almost parallel-sided to beyond the middle, base slightly and evenly arched, and not suddenly wider than prothorax; with rows of punctures, each containing and partly concealed by a scale; interstices nowhere ridged. Basal segment of abdomen slightly concave in middle; second in middle almost as long as first, and almost as long as third and fourth combined. Legs rather short and stout, femora edentate. Length, 3 mm.

♀. Differs in being slightly more robust, rostrum longer, thinner, more narrowed in front, less of the base clothed, the punctures in front sparser and smaller, antennae inserted slightly nearer base than apex of rostrum, abdomen larger and basal segments evenly convex.

South Australia: Barton and Tarcoola (A. M. Lea).

A pale species, with elytra suggestive of *Emplesis* and *Storeus,* but with normal claws; the pectoral canal is rather deep and with well defined walls in front, but is narrowed between the front coxae, which almost touch at the base. The base of the elytra not at all trisinuate, is an unusual feature in the genus. The punctures on most parts of the body are evidently as crowded as on most species of the genus, and similarly concealed by their contained scales. There are from eight to ten small white spots, in three transverse series on each elytron, and a few isolated ones, but they are inconspicuous, and due almost as much to the scales there being slightly denser than elsewhere, as to their paler shade.

Diethusa nigrosuturalis, n. sp.

♂. Black, elytra (except suture), rostrum (except base), antennae and legs reddish. Densely clothed with white scales, the prothorax with a large, dark, mediobasal spot.

Rostrum very little longer than prothorax, parallel-sided, slightly curved; with crowded, concealed punctures on basal half, elsewhere naked and small, but sharply defined. Antennae inserted about two-fifths from apex of rostrum. Prothorax small, about once and one-half as wide as the median length. Elytra briefly subcordate, base gently trisinuate and much wider than prothorax; with rows of large punctures, appearing much smaller through clothing; interstices distinctly costate almost throughout. Basal segment of abdomen widely and shallowly depressed in middle, second about as long as third and fourth combined. Femora stout, strongly and acutely dentate. Length, 3·5 mm.

South Australia (E. L. Savage); unique.

The elytral interstices costate, except close to the base, readily distinguish this from most species of the genus; on *D. porphyrea* the fourth interstice on each elytron is suddenly terminated, much as on *D. concinna* and *basipennis,* but on the present species the fourth interstice is normal, and the elytra in fact are rather feebly trisinuate at base, instead of strongly so; on *D. aestuans* the clothing and rostrum are very different; *D. consanguinea* is a smaller species, with different clothing, and *D. nigrovaria* is a much smaller, and otherwise very different species. The eyes are closer together than is usual in the genus. The large dark spot on the prothorax is very conspicuous, but is

due mostly to the scales on it (which are hardly darker than stramineous) being much sparser than on the adjacent parts.

Diethusa subaurifera, n. sp.

♂. Dull reddish, parts of under surface black. Densely clothed with rusty-red and white or whitish scales.

Rostrum comparatively short and wide, feebly curved, no longer than prothorax; with dense punctures throughout, but concealed on basal third; with a median ridge extending to one-third from apex, where the antennae are inserted. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base. Elytra oblong-subcordate, sides parallel to about the middle, base trisinuate and much wider than prothorax; with rows of partly concealed punctures, in narrow striae; interstices nowhere carinated, but the third and fifth slightly elevated above the others, except about base and apex. Basal segment of abdomen widely and shallowly depressed in middle, second slightly longer than third and fourth combined. Femora stout, front ones edentate, the others strongly and acutely dentate. Length, 3·8-4·0 mm.

♀. Differs in having the abdomen larger, with the basal segment evenly convex.

Victoria: Stawell, in October (H. W. Davey).

Of the size and general appearance of *D. majorina* and *amplipennis*, but rostrum of both sexes decidedly shorter, and front femora edentate. On those species the front femora are strongly and acutely dentate; on the present species, although there is an obtuse swelling at the position of a tooth, the tooth itself is absent. *D. apicalis*, with a somewhat similar appearance, has very different front tibiae and hind femora. Some varieties of *D. squamivaria* and *pretiosa* have similarly coloured scales, but on those species the front femora also are acutely dentate. The elytral interstices are in places slightly undulated, but they could not fairly be regarded as even subtuberculate. The rusty scales, in some lights, have a golden gloss; they are uniform on the head, and cover most of the prothorax and elytra; on the latter the white scales are condensed to form numerous small spots, many of which are transversely confluent; on parts of the under surface and legs the scales are stramineous. The rostrum of the female is slightly longer and thinner than on the male, but the differences are very slight; the sexual differences of the abdomen, however, are sufficiently distinctive.

Diethusa falcata, n. sp.

♂. Reddish. Densely clothed with variegated scales.

Rostrum gently curved, about the length of prothorax; basal half with crowded punctures (concealed near base) and fine ridges, elsewhere with crowded punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base. Elytra briefly oblong-subcordate, base strongly trisinuate, and much wider than prothorax; with rows of large, partly concealed punctures; interstices nowhere ridged. Basal segment of abdomen widely and shallowly depressed in middle, second as long as third and fourth combined. Femora stout, front ones feebly, the others moderately dentate; front tibiae rather thin, rather strongly arched or falcate, apical hook acute and comparatively long. Length, 3·0-3·2 mm.

♀. Differs in having the rostrum longer, thinner, with sparser and smaller punctures, base not squamose, antennae inserted slightly nearer its base than apex, elytra with fourth interstice abruptly ended at base before

the third, so that the base appears deeply notched on each side, abdomen larger, the basal segments evenly convex, and front tibiae stouter, only feebly curved, and apical hook much smaller.

Victoria: Ringwood, in October (C. Oke).

In appearance somewhat like large specimens of *D. tuberculata* (which also has front tibiae falcate), but the abdomen of the male not tuberculate. On this species the sudden pinching out of the fourth interstice at the base is confined to the female; on *D. basipennis* and *congrua* it occurs on both sexes (the male of the latter species also has falcate front tibiae); on the male of *D. porphyrea* (the only sex before me) and on the type of *D. albomaculata* (a female). On one specimen the metasternum is blackish. The pale scales on the upper surface vary from whitish to rusty-brown, and cover about half of the surface, the others being sooty; the latter form a large patch on the pronotum, fairly wide at its apex and triangularly pointed to its base; on the elytra they form a zone, usually without a mixture of other scales, for about the basal fourth or fifth, and are irregularly distributed elsewhere (on two specimens forming irregular fasciae about the summit of the apical slope), on the under surface and legs the scales are mostly whitish.

Diethusa insuavis, n. sp.

♂. Dark reddish, scutellum and parts of sterna darker. Densely clothed with variegated scales on upper surface, whitish on under parts.

Rostrum thin, slightly longer than prothorax, moderately curved; with crowded punctures in front of antennae (which are inserted two-fifths from apex), seriate and with fine ridges behind them, and squamose about base. Prothorax moderately transverse, sides gently rounded and rapidly diminishing in width to apex. Elytra subcordate, sides parallel for a short distance only, base distinctly trisinuate and scarcely one-fifth wider than base of prothorax; with deep punctures in narrow striae, partly concealed by clothing; interstices nowhere ridged. Basal segment of abdomen gently depressed in middle, second slightly shorter than third and fourth combined. Front femora feebly, middle moderately, hind ones more strongly and acutely dentate. Length, 3·5 mm.

♀. Differs in having the rostrum longer, thinner, with sparser and smaller punctures, median ridge shorter, squamose only close to base, antennae inserted slightly nearer base than apex, prothorax less transverse and less rapidly diminishing in width to apex, two basal segments of abdomen larger and evenly convex, the second slightly longer than third and fourth combined, and front tibiae slightly shorter and stouter, with the apical hook distinctly smaller.

Victoria: Eltham, in September (C. Oke).

A dingy species, smaller than *D. mollis* and larger than *D. famelica*, but with the darker scales somewhat similar. Structurally and in size it is fairly close to *D. trifasciata*, but the clothing is very different. On the upper surface the scales vary from a rather dirty white, through rusty-brown to almost sooty; on the pronotum of the type there are four small, and almost sooty, well defined spots; on the female the spots are more diffused and rusty-brown; on the elytra of both the majority of the scales are sooty-brown or rusty-brown, with the whitish ones condensed to form numerous small spots, many of which are transversely conjoined to appear as thin, asymmetrical fasciae. Seen from behind the elytra appear truly cordate, but from directly above the trisinuation of the base is conspicuous.

Diethusa minuscula, n. sp.

♀. Reddish. Moderately clothed with white or whitish scales.

Rostrum thin, moderately curved, slightly longer than prothorax; with fine punctures in front, becoming lineate in arrangement behind antennae, and concealed near base. Antennae inserted distinctly nearer base than apex of rostrum. Prothorax with base scarcely one-fourth more than the median length, and about twice the width of apex. Elytra rather short, sides subparallel to about middle, base strongly trisinuate and distinctly but not suddenly wider than prothorax; with rows of fairly large punctures, in even striae; interstices nowhere ridged. Two basal segments of abdomen strongly convex, second slightly longer than third and fourth combined. Front femora feebly, the others rather strongly and acutely dentate. Length, 2·5-3·0 mm.

Victoria: Sea Lake, in December (J. C. Goudie, No. 849).

A minute species, about the size of *D. tantilla*, but clothing of only two colours, and those not sharply defined. *D. famelica* is darker, with denser and more ashen scales, and the rostrum of its female thinner. *D. tenuirostris* has very different clothing and rostrum. *D. nigrovaria* and small specimens of *D. subfasciata* also differ considerably in colour and clothing, and the former has some of the elytral interstices ridged. On two specimens the metasternum is almost black, on two others it is scarcely darker than the adjacent parts. Some of the scales on the upper surface are more or less rusty, they do not appear to form a distinct pattern, but this may be due to partial abrasion. From most directions the front femora appear edentate.

Diethusa heterodoxa, n. sp.

♀. Reddish, scutellum and under surface blackish. Densely clothed with variegated scales on upper surface, becoming almost uniformly white on under parts.

Rostrum rather thin; parallel-sided, moderately curved, slightly longer than prothorax; with subseriate, partly concealed punctures on basal third, small and naked elsewhere. Antennae thin, inserted one-third from apex of rostrum. Prothorax moderately transverse, sides feebly diminishing in width to near apex, and then rapidly to apex itself. Elytra short, subcordate, sides nowhere parallel, base distinctly trisinuate and much wider than prothorax; with rows of large punctures, appearing much smaller through clothing, interstices nowhere distinctly ridged, but the third, fifth, and seventh in places feebly elevated above the others. Abdomen moderately convex, second segment as long as third and fourth combined. All femora strongly and acutely dentate. Length, 3·5 mm.

New South Wales: Barellan, from stomach of a wood swallow, *Artamus personatus* (Prof. J. B. Cleland); unique.

The parallel-sided rostrum associates this species with *D. subfasciata* in my table of the genus,[3] but that is a smaller and otherwise very different species. In general appearance it is fairly close to *D. majorina*, but the antennae are inserted nearer apex of rostrum than on both sexes of that species, and the pronotum has three white basal spots. It also closely resembles *D. albomaculata*, but the sinuation of the base of the elytra is less pronounced, and the fourth interstice is not suddenly abbreviated. The rostrum is very different from that of *D. pretiosa*, although the clothing closely resembles that of one of its varieties. The scales on the upper surface are stramineous or whitish, and rusty-red. On the head the scales are but little variegated, on the pronotum they are mostly pale rusty-red, with three white spots at the base, there are also some whitish scales on the sides, but invisible from directly above. On the elytra the rusty scales are somewhat darker than on the prothorax, and the paler scales are mostly stramineous, they form numerous small spots (about fifty on each elytron); in

(3) Lea, Proc. Linn. Soc. N.S. Wales, 1899, p. 252.

places they are subconfluent, but they are not subfasciate in arrangement; to a certain extent they are as on *D. potens*, on which the rostrum, antennae, and front tibiae are very different. The apical hook of the front tibiae commences on the upper surface, and projects but slightly outwards from the oblique apex; but it is certain to be different on the male. The metasternal episterna are densely punctate at the ends, but near the anterior triangle the punctures are reduced to a short irregular row; this might be considered as denoting that the species is a *Melanterius*, but otherwise it is quite a normal *Diethusa*. Although taken from the stomach of a bird the type is in perfect condition.

Diethusa orthodoxa, n. sp.

Reddish. Densely clothed with variegated scales, becoming white on under parts.

Rostrum parallel-sided, gently curved, slightly longer than prothorax; with sublineate punctures near base, elsewhere sparse, small, and naked. Antennae thin, inserted one-third from apex of rostrum. Prothorax and elytra with outlines and punctures as described in preceding species, except that the odd interstices are still more feebly elevated above the adjoining ones. Metasternal episterna with crowded punctures throughout. Basal segment of abdomen gently depressed towards base, second as long as third and fourth combined. Front femora stout, all strongly and acutely dentate. Length, 3·5-4·0 mm.

New South Wales: Orange (H. J. Carter).

In many respects near the preceding species, but the episterna have crowded punctures throughout. In general appearance it is near some varieties of *D. pretiosa*, but the rostrum is parallel-sided, instead of narrowed from insertion of antennae to apex. It is decidedly close to *D. majorina*, but is slightly more compact, the rostrum slightly shorter, smoother, and less clothed. Structurally and in general it is also close to *D. amplipennis*, but the rostrum is much shorter than on the female of that species, and the clothing is more variegated. *D. subaurifera* differs considerably in the rostrum and femora. The hook of the front tibiae proceeds from half-way up the oblique apex, and the rostrum is nowhere clothed, but as the basal segment of abdomen is gently depressed towards the base, the specimens before me are possibly males. On one of them the metasternum is rather deeply infuscated. On the prothorax the scales are whitish, with obscure rusty-red spots, on the elytra the rusty-red ones are about as numerous as the paler ones, but the latter are more conspicuous, and cause the surface to appear multimaculate, or narrowly and irregularly fasciate.

Diethusa apicispina, n. sp.

♀. Dark brown, parts of under surface black, rostrum, antennae and tarsi reddish. Densely clothed with whitish and sooty-brown scales, becoming uniformly white on under parts.

Rostrum parallel-sided, moderately curved, about the length of prothorax; with sparse and minute punctures, except quite close to base, where they are moderately strong. Antennae thin, inserted two-fifths from apex of rostrum. Prothorax at base almost twice as wide as the median length, sides gently rounded and rapidly diminishing in width to apex. Elytra subcordate, sides nowhere parallel, base moderately trisinuate and distinctly but not much wider than prothorax; with rows of punctures in striae, both punctures and striae somewhat obscured by clothing; interstices wide, some of the lateral ones ridged. Basal segments of abdomen strongly convex, the second as long as the third and fourth combined. Femora stout, all strongly and acutely dentate; front and middle tibiae wider than usual, strongly arched at base, the upper surface incurved at middle. Length, 3·4-3·6 mm.

Queensland: Dalby (Mrs. F. H. Hobler).

The apical hook of the front tibiae, instead of being directed at an almost right angle from the general line, is almost continuous with it, and begins so far back that its end terminates shortly before the tip of the tibia itself; this is deflected slightly upwards, and is without a subapical tooth. The hook of the middle tibiae is much as on the front ones. In general appearance it is like *D. famelica,* on an enlarged scale, but with very different tips to the tibiae. The two specimens taken are females, but in *Diethusa* some females are quite as distinct as males. On the type the dark scales are scattered singly on the head; on the prothorax they form a large mediobasal spot, narrowly connected with the apex, but with scattered white scales; on the elytra they are condensed to numerous irregular spots, sometimes appearing as stains. On the second specimen the dark scales cover more of the surface, but are still more irregularly distributed. Four of the outer ridges on each elytron are ridged posteriorly, the ridges lengthening till the one behind the shoulder commences near the base.

Diethusa simplicipennis, n. sp.

Reddish; scutellum, elytra, and metasternum somewhat darker than other parts. Densely clothed with stramineous scales, somewhat variegated on upper surface, becoming white on under parts.

Rostrum thin, curved, parallel-sided, one-third longer than prothorax; with seriate punctures and fine ridges on basal half (squamose towards base), in front with sparse and small punctures. Antennae inserted two-fifths from apex of rostrum. Prothorax almost twice as wide at base as the median length, apex about two-thirds the width of base. Elytra rather long, sides nowhere quite parallel, base gently and, except at scutellum, evenly arched, and but little wider than prothorax; with rows of punctures of moderate size, each containing and partly concealed by a scale; interstices nowhere ridged and, except to a slight extent on sides, not even separately convex. Abdomen evenly convex, second segment as long as third and fourth combined. Legs rather short, femora edentate. Length, 3 mm.

Queensland: Bribie Island (A. M. Lea); unique.

The even arcuation of the base of the elytra is aberrant in the genus. At first glance the species resembles an *Aolles,* with long elytra, but the claw joints are of normal length, with well-defined claws. It is allied to *D. pallida,* but the faint tessellation of the elytra is due to feeble dark spots, instead of pale ones. The colour is somewhat as in *D. congrua,* but the species is narrower, and the elytra (especially at base) are very different. The series of punctures on the elytra are readily traceable through the clothing, but they are not in striae, except that towards the sides faint ones become evident. On the pronotum a few sooty scales are scattered singly, on the elytra they are more numerous, and in places condensed to form a few inconspicuous spots. The type, judging by the rostrum and abdomen, is a female.

Diethusa basipennis, n. sp.

♂. Reddish, scutellum and parts of under surface black. Densely clothed with variegated scales on upper surface, white on under parts.

Rostrum thin, longer than prothorax, moderately curved; apical half with small but sharply defined punctures, becoming larger towards, but concealed about base. Antennae inserted very little nearer apex than base of rostrum. Prothorax (with head) subconical, base strongly bisinuate. Elytra wide, sides feebly diminishing in width to beyond the middle; with rows of fairly large punctures in narrow striae, appearing very narrow through clothing; interstices nowhere ridged, fourth abruptly terminated before the third at base. Basal segment of abdomen with a wide and fairly deep median excavation, second segment slightly shorter than fifth, and slightly longer than third

and fourth combined. Front femora rather acutely but not very strongly dentate, the others more strongly and acutely so. Length, 4·0-4·5 mm.

♀. Differs in having the rostrum longer, thinner, and less curved, with sparser and finer punctures, less of the base clothed, antennae inserted distinctly nearer its base than apex, abdomen larger and more convex, and front tibiae stouter, with the apical hook shorter.

Western Australia: Cue and Ankertell (H. W. Brown).

The abrupt termination of the fourth interstice at the base of each elytron causes the intervening parts to appear strongly produced on to the prothorax, with the base incurved at the scutellum, and notched before each shoulder, instead of evenly trisinuate. This readily distinguishes it from all other species of the genus, except *D. congrua* and *falcata*, on which the front tibiae are falcate. *D. porphyrea*, on which some of the elytral interstices are conspicuously ridged, and the following species, on which the rostrum although long, is decidedly shorter, the front tibiae different at apex, and the clothing different. On *D. parvicollis, acutidens*, and *inaequalis*, the base is strongly but evenly trisinuate. The rostrum of the female is about half as long again as the prothorax, and when at rest extends almost to the abdomen. On an almost completely abraded specimen (the only one from Ankertell) the under surface and femora are entirely black, but on all the others the femora are no darker than the tibiae, and the abdomen is usually reddish. The scales of the upper surface vary considerably, and appear to be easily abraded; they are mostly white, often stained, the stains increasing from pale stramineous to a rather dark rusty-brown. On the pronotum there are often four small sooty spots, sometimes reduced to two rather faint ones, or even absent, but on one speci men the four are well defined, and the inner two are connected with the apex by a fairly wide median line. On the elytra black spots are numerous and very irregularly distributed, but sharply defined, even when amongst rather dark rusty-brown ones; on one female they are sparse and almost confined to the suture.

Diethusa albomaculata, n. sp.

♀. Reddish. Densely clothed with variegated scales.

Rostrum thin, gently curved, parallel-sided, slightly longer than prothorax; with sparse and small punctures in front, becoming larger and more crowded towards base, but concealed on basal fourth. Antennae inserted slightly nearer base than apex of rostrum. Prothorax and elytra with outlines and punctures much as on preceding species. Two basal segments of abdomen strongly convex, the second slightly longer than third and fourth combined. Femora acutely dentate, the front ones more strongly than the others. Length, 4 mm.

Victoria: Melbourne (H. W. Davey); unique.

At first glance an ordinary looking member of the genus, but with the notched base of the elytra of the preceding and allied species. Some varieties of *D. pretiosa* have similarly coloured scales, but the fourth interstice on that species is normal. Most of the scales on the upper surface are of a bright rusty-red colour, changing to stramineous and whitish on the under parts. On the pronotum there are four small, whitish spots, transversely placed (and several on the sides invisible from above), and a few black scales, mostly scattered singly. On the elytra there are numerous small white spots, many of which are conjoined to form feeble asymmetrical fasciae, and there are a few dark spots on the suture. The tip of the front tibiae appears bidentate, owing to the subapical tooth being nearer the apex than usual, and its fascicle extending almost level with the apical hook.

Diethusa aulica, n. sp.

♂. Reddish. Densely clothed with scarlet and stramineous scales, becoming whitish on under parts.

Rostrum parallel-sided, moderately curved, slightly longer than prothorax; with fairly dense and small punctures in front, becoming larger and lineate in arrangement towards, and squamose on basal fourth. Antennae inserted about one-third from apex of rostrum. Prothorax moderately transverse, sides gently decreasing in width to near apex, and then rapidly to apex itself. Elytra moderately long, sides nowhere quite parallel; with rows of fairly large, partly concealed punctures, some of the lateral interstices very feebly ridged. Basal segment of abdomen flattened in middle, second as long as third and fourth combined. Femora stout, all acutely dentate. Length, 3·3-3·6 mm.

♀. Differs in having the rostrum longer, thinner, with sparser and smaller punctures, nowhere lineate in arrangement, and much less of base squamose, antennae inserted two-fifths from its apex, abdomen larger, the two basal segments evenly convex, femoral teeth truncated, and apex of front tibiae wider, with the apical hook diverging from about half-way up the oblique apex, instead of nearer the tip.

New South Wales: Bogan River, on "wilga," *Geijera parviflora* (J. Armstrong).

The clothing is of practically the identical shades of those of *D. metasternalis*, but is differently disposed, and the male of that species has a distinctive impression on the metasternum and abdomen. On one of the varieties of *D. squamivaria* the clothing is also of the same shades of colour, but the front tibiae of its female are different. On some varieties of *D. pretiosa* and *concinna* the shades of colour are the same, but the rostrum of both sexes is very different. The elytra are rather longer than usual in *Diethusa*, but the punctures of the metasternal episterna, although less dense than usual, are not in the single row of *Melanterius*. It is narrower than *D. orthodoxa*, and the clothing is brighter and differently disposed. The scarlet scales form a square spot on each side of the base of the pronotum, with a stramineous line between, but on one female the spots and median line are continued to the apex. On the elytra they are irregularly distributed, so that the paler ones appear to form from three to five irregular fasciae. They are smaller than the pale ones, so closely applied to the derm, and approach the colour of the derm itself so much, that they are inconspicuous from above, and cause the surface to appear irregularly naked.

Diethusa alternata, n. sp.

♀. Reddish. Densely clothed with rusty-brown and stramineous scales, becoming almost white on under parts.

Rostrum the length of prothorax, sides feebly incurved to middle; with rather small and dense punctures in front, becoming lineate in arrangement towards, and squamiferous on basal third. Antennae inserted about two-fifths from apex of rostrum. Prothorax (with head) subconical, sides slightly rounded, and rapidly diminishing in width to apex. Elytra rather short, sides nowhere parallel, base strongly trisinuate and much wider than prothorax; with rows of punctures in narrow striae, partly concealed by clothing; interstices nowhere ridged. Two basal segments of abdomen strongly convex, second slightly longer than third and fourth combined. Femora stout, front ones scarcely visibly, middle ones slightly, hind ones rather strongly and acutely dentate. Length, 3 mm.

New South Wales: Bogan River, on "wilga," *Geijera parviflora* (J. Armstrong); unique.

Each elytron from some directions appears to have the fourth interstice abruptly terminated before the base, but this is not the case, as it is only strongly narrowed there, the appearance accentuated by a patch of whitish scales on the base of the third and another on the shoulder. Of those having the base truly notched, *D. congrua* and *falcata* have falcate front tibiae and very different clothing; *D. basipennis* and *albomaculata* have front femora acutely dentate, and *D. porphyrea* has some of the interstices acutely ridged. *D. majorina, pretiosa, heterodoxa, orthodoxa, squamivaria,* and *amplipennis,* somewhat similarly clothed, have acutely dentate front femora. *D. subaurifera,* with similar legs, is slightly larger, with some of the interstices slightly elevated, and fourth interstice not narrowed at the base. The rusty-brown scales form three longitudinal lines on the prothorax, of which the median one is triangularly dilated on each side of middle, there is also a small spot, invisible from above, on each side. On the elytra the rusty and stramineous, sometimes whitish, scales are in spots mostly transversely conjoined, so that there appear to be five or six asymmetrical, alternate fasciae of each colour. On each of the front and middle tibiae, the apical hook and subapical tooth are so close together that the apex appears finely bidentate, but not as on *D. apicalis.*

Diethusa apicalis, Lea.

Two females from Natya and Bendigo (Victoria) belong to this species, one is slightly larger but otherwise much the same as the type, the other is still larger (4·3 mm.) and has more variegated clothing, the suture and numerous small spots on the elytra being black, and parts of the prothoracic clothing black. Many of the suberect setae of the upper surface are also black.

Diethusa congrua, Lea (formerly *Melanterius*).

After the examination of many additional species of *Melanterius* and *Diethusa (Lybaeba),* to those dealt with in my revision in 1899, it seems desirable to attach more importance to the punctures of the metasternal episterna than I then did. I now consider that, where they are densely punctate, the species should usually be referred to *Diethusa*, and never to that genus when they are in a single row. The changes in the size of the second segment of abdomen are so gradual, that it is not to be relied upon. *M. congruus,* having the metasternal episterna densely punctate, is therefore transferred to *Diethusa.*

Diethusa funerea, Lea.

Four specimens, two of each sex, taken between Karoonda and Peebinga (South Australia) belong to this species. The rostrum is slightly shorter and wider on the male than on the female; the two basal segments of the abdomen of the female are strongly convex throughout, but on the male they are flattened in the middle, although convex on the sides.

Diethusa pallidicollis, Lea.

The male of this species differs from the female in having the rostrum somewhat shorter and stouter, parallel-sided and clothed to insertion of antennae (almost in exact middle), and less rapidly narrowed, but still noticeably so, from there to apex, and the basal segment of abdomen with a large shallow depression, partly continued on to metasternum.

Diethusa picta, Lea.

A female from Ooldea (South Australia) differs from the type in being smaller, 2·5 mm., and with the black and white scales more sharply defined.

DIETHUSA SULFUREA, Lea.

Mr. J. Armstrong has recently taken a second male, the sex of the type, of this beautiful species, on the Bogan River; it is slightly larger, 4 mm., than the type, and more of its clothing is golden, the third and fifth interstices are more noticeably elevated above the adjacent ones, and the inequalities are slightly more pronounced.

NEOLYBAEBA REMOTA, Blackb.

Six specimens from the Bogan River (New South Wales), taken by Mr. J. Armstrong on the "eumung," *Acacia longifolia,* are more brightly coloured than the type, the scales on the upper surface being golden or golden-red, with numerous white spots, and a few black ones on the elytra; on the pronotum the scales are mostly white, but there is a square golden patch on each side of the middle, and a triangular or rounded one on each side. Six specimens, including the type, are females; the male differs in having the rostrum stouter, clothed almost to the middle, and with fairly distinct punctures in front, the two basal segments of abdomen are flattened in the middle, instead of evenly convex. It is doubtful if the genus can be maintained as distinct from *Diethusa,* from all the described species of which it is at once distinct by the binodose elytra; *D. nodipennis* has multinodose elytra.

Cryptoporocis, n. g.

Head small. Eyes small, lateral, widely separated, coarsely faceted. Rostrum rather thin, slightly longer than prothorax, gently curved, scrobes almost meeting at base of under surface. Scape thin, inserted nearer apex than base of rostrum; funicle with two basal joints longer than wide, the others transverse; club short and compact. Prothorax long and usually flattened, ocular lobes not advanced. Scutellum small. Elytra elongate, shoulders slightly rounded, sides parallel or subparallel to beyond the middle, base truncate or very feebly trisinuate; with rows of large punctures. Pectoral canal rather wide in front, fairly wide and with distinct walls narrowed between front coxae. Mesosternal receptacle gently concave, sides slightly upturned, open. Metasternum shorter than the following segment, episterna each with a row of punctures. Abdomen with two basal segments large, the second as long or almost as long as three following ones combined. Legs rather long, femora edentate, tibiae thin and compressed, apical hook acute, tarsi thin, third joint moderately bilobed, fourth elongate. Depressed, opaque, densely punctate, setose and apterous. Type of genus, *C. sordidus.*

Despite the very different appearance of these insects and their habits (living in moss or fallen leaves and under logs or bark), it appears desirable to regard them as allies of *Melanterius.* The pectoral canal is quite as pronounced as on that genus, its walls on the prosternum are as sharply defined, the front coxae are as widely separated (more so than on several species of *Diethusa),* although separated only about half the width of the canal in front of them; the middle coxae are widely separated, and the plate between them slopes evenly downwards. The metasternal episterna are almost as large as on *Melanterius,* and its allies, although the adjoining surface being rather roughly sculptured, their size is not at once evident. I have only made certain of two species, *C. sordidus* and *carinatus,* but believe them all to be apterous. The sexes may be distinguished, *inter se,* by the rostrum and sometimes by the abdomen, but there appears to be no external character by which the sex of a single specimen may be identified with certainty. The rough appearance of the more parallel-sided species is suggestive of *Dryopthorus,* of the Cossonides. In *Solenobaris,* of the Baridiides, the pectoral canal is quite as pronounced, but on that genus the side pieces of the mesosternum are thrust like a stout wedge between the elytra and prothorax.

TABLE OF SPECIES.

A. Elytra with fascicles before as well as beyond the middle ..	*bigranulatus*
AA. Elytra without fascicles, or at least not before the middle.	
B. Elytra short and nowhere parallel-sided	*insignipes*
BB. Elytra longer and partly parallel-sided.	
C. Some interstices tuberculate about summit of apical slope	*carinatus*
CC. No interstice tuberculate about summit of apical slope ..	*sordidus*

Cryptoporocis sordidus, n. sp.

♂. Dark reddish-brown, parts of under surface and obscure markings on upper surface black. Clothed with short, stramineous setae, longer on the elytra than elsewhere and sloping.

Rostrum with crowded punctures and fine ridges to antennae, in front with dense, naked punctures. Antennae inserted about one-third from apex of rostrum. Prothorax about as long as the median width, with a small mediobasal impression and a transverse subapical one, the two connected by a feeble median carina; with crowded punctures. Elytra rather long, sides subparallel and not much wider than prothorax; with rows of fairly large punctures, in regular striae, the interstices flattened and each with a row of small and normally concealed punctures. Two basal segments of abdomen large, with crowded punctures as on prothorax, the second segment slightly shorter than first and slightly longer than the three following combined. Tibiae rather thin, narrowed to apex, apical hook acute. Length, 2·6-2·8 mm.

♀. Differs in having the rostrum slightly longer and thinner, its ridges shorter, more of the apex bald and with smaller punctures, antennae inserted slightly more distant from apex, and abdomen larger, with two basal segments rather strongly convex, instead of flattened in middle.

Tasmania: Hobart (J. J. Walker); Mount Wellington, under soft rotting bark, Huon River (A. M. Lea). South Australia.

The surface generally appears to have a greasy or mealy covering, causing the specimens to look dirty, and filling up the punctures much as on species of *Dryopthorus*. The black markings of the elytra are not very distinct even when the clothing has been removed, they form a broken V, commencing on each shoulder, and directed towards the suture beyond the middle; there are also some spots beyond the V, and one on each side of the prothorax. Three specimens from Long Bay (Tasmania) are somewhat larger (3·0-3·2 mm.), and have a few hairs on the thickened part of the scape, and the setae on the upper surface somewhat longer and more numerous, with the third interstice at the base and each shoulder somewhat elevated.

Cryptoporocis carinatus, n. sp.

♂. Black, antennae and tarsi pale reddish. With stramineous or rusty setae, distinct in parts, sparse or obscured elsewhere.

Head with crowded punctures. Rostrum with coarse, crowded punctures and fine ridges to apical fifth, which is shining and with small, but clearly defined punctures. Antennae thin, inserted about one-fifth from apex of rostrum. Prothorax almost as long as wide, with a shallow mediobasal depression and a transverse subapical one, the two connected by a narrow distinct carina; with crowded punctures. Elytra rather long, subparallel-sided, base feebly trisinuate; with rows of fairly large punctures, in regular striae, the interstices flattened and each with a row of small but normally concealed punctures; third, fifth and seventh slightly elevated and subtuberculate at and about the summit of the apical slope. Two basal segments of abdomen large, the first gently concave in middle, the second about as long

as the three following combined. Legs rather long and thin, tibiae gently arched and each terminated by an acute hook. Length, 4·0-4·2 mm.

♀. Differs in having the rostrum slightly longer, with crowded punctures only on basal half, the shining part not abruptly separated from the opaque part, antennae inserted about one-fourth from apex of rostrum, and abdomen larger, with the basal segment evenly convex.

Tasmania: (Aug. Simson); Mount Wellington and Strahan (A. M. Lea).

Decidedly larger than the preceding species, with the prothoracic carina more conspicuous, and some of the elytral interstices tuberculate or subtuberculate; the outlines and punctures are much the same, and the surface generally obscured by a similar muddy exudate. Four specimens, from Gould's Country (Tasmania, Simson), are larger (5-6 mm.), and have the tubercles on the odd interstices of the elytra sharply pronounced, on one of them they are more numerous than on the others, there being six on the third (of which one is antemedian), and about ten on each of the fifth and seventh, on each of which they commence near the base. Three of them are males, with the depression of the abdomen present but shallower than on the type.

Cryptoporocis bigranulatus, n. sp.

♂. Black, antennae and tarsi reddish, tip of rostrum obscurely diluted with red. Moderately clothed with rusty-red setae, on the elytra many condensed to form fascicles.

Head small, bald and almost impunctate. Rostrum distinctly longer than prothorax; with coarse, crowded, partly concealed punctures, the apical fifth shining and with minute punctures. Scape rather long and thin, inserted one-fourth from apex of rostrum. Prothorax slightly wider than long, with a mediobasal depression and a feeble median carina; with crowded, partly concealed punctures. Elytra subparallel-sided; with rows of fairly large punctures, in striae about as wide as the interstices. Under surface with dense punctures, in most parts about as large as on prothorax. Basal segment of abdomen depressed at base, its apex with two distinct granules close together, second almost as long as three following combined. Length, 3-4 mm.

♀. Differs in having the rostrum longer and thinner, with more distinct ridges (owing to the punctures being less irregular), more of the apex shining, antennae inserted not quite as close to its apex, abdomen larger, basal segment evenly convex and without granules.

Tasmania: Waratah, in moss (F. M. Littler and A. M. Lea).

Very distinct by the fasciculate elytra, and granulate abdomen of the male. The pectoral canal and its walls are not quite as sharply defined as on others of the genus, and the front coxae are less (although distinctly) separated. The fascicles on the elytra are more numerous just beyond the middle than elsewhere, but some are present near both base and apex; they are usually supported on feeble swellings of the interstices. On all the specimens there are a few distinct setae on the thickened part of the scape.

Cryptoporocis insignipes, n. sp.

♂. Black or blackish, antennae and legs more or less reddish. Moderately clothed with rusty-red setae.

Head with coarse, crowded punctures in front, base normally concealed. Rostrum scarcely longer than prothorax; with coarse, crowded punctures and irregular ridges to near apex, which is shining and with minute punctures; sides slightly dilated at insertion of antennae (about one-third from apex), where the beginning of the scrobes is visible from above. Prothorax moderately transverse, sides strongly rounded; with crowded punctures. Elytra rather convex, scarcely once and one half as long as wide, sides rather

strongly rounded; with rows of large punctures, in striae slightly wider than the interstices. Two basal segments of abdomen with crowded punctures, the first depressed at base. Length, 2·5 mm.

Victoria; Belgrave in January, and Healesville in March, in both places from moss (F. E. Wilson).

A small species, with sides of prothorax and elytra more rounded than usual, and prothorax without a mediobasal depression and median carina, and at first glance suggestive of some of the moss-frequenting species of *Decilaus*. It should possibly have been referred to a new genus, as its metasternum is shorter than on the other species, and the episterna appear to be absent; the pectoral canal, however, is in agreement, as are many other generic features. The front legs are remarkable; each femur, from some directions, appears rather wide, but from others very wide and lopsided, its lower surface has a wide groove for the reception of the tibia; this from some directions appears rather narrow and compressed, with the lower surface feebly bisinuate, but on twisting it round the outlines alter, till, near the base, it becomes very wide (fully half as wide as long) and flattened; the other femora are less stout, scarcely grooved, and the other tibiae are much as those of other species. The elytra are sometimes obscurely reddish, their setae are rather numerous, and in places are slightly compacted together, but they do not form distinct fascicles. A larger (3 mm.) specimen from Belgrave, is probably a female of the species; its front femora are less stout, groove less conspicuous, front tibiae not much different from the others, two basal segments of abdomen larger and evenly convex, and rostrum slightly longer, with more of its apex shining, scarcely dilated at insertion of antennae (these not quite as close to the apex), with the beginning of the scrobes but slightly evident from above.

Perissops weidenbachi, n. sp.

♂. Black, parts of antennae and of tarsi obscurely diluted with red. Moderately clothed with rusty-brown and whitish scales and setae, and with ten conspicuous, dark velvety-brown spots.

Head with crowded and rather small punctures, with a narrow interocular impression. Eyes large. Rostrum moderately curved, the length of prothorax, basal half with crowded and moderately coarse punctures, partly concealed near base, and with a narrow median carina, elsewhere with much smaller punctures. Antennae inserted two-fifths from apex of rostrum, scape slightly longer than funicle, two basal joints of the latter elongate, club long and cylindrical, about the length of six preceding joints combined. Prothorax subconical, sides somewhat rounded but rapidly diminishing in width from base to apex; with rather large deep punctures on sides, becoming much smaller towards middle. Scutellum distinct. Elytra closely applied to and outlines subcontinuous with those of prothorax, widest at basal fourth; with rows of large, deep punctures; the interstices densely and finely granulate, the fourth and others to the margins finely ridged (partly or entirely). Under surface with punctures varying from fine to moderately large; each metasternal episternum with a single interrupted row. Legs long and rather thin, femora acutely dentate, tibiae compressed, front tarsi wide, with a long and somewhat golden fringe on each side. Length, 11-13 mm.

♀. Differs in having smaller eyes, rostrum thinner, with smaller punctures and less clothed, legs much shorter and front tarsi not conspicuously fringed.

Territory of New Guinea: Wau Creek (W. W. Weidenbach).

A very distinct species, allied to the Queensland *P. tarsalis*, and with similar front legs in the male. Of the velvety patches there are four across

the apical third of prothorax (the anterior ones small), two close together near each shoulder, and a large one, about the middle of each elytron, much nearer the suture than the side.

Perissops funiculatus, n. sp.

♂. Black, antennae and tarsi obscurely reddish. Densely clothed with variegated scales and setae.

Head with crowded, concealed punctures. Rostrum slightly longer than prothorax, sides dilated towards base but narrowed at base itself; with crowded squamiferous punctures on basal half, sparser and sublineate in arrangement elsewhere, and with a median ridge. Antennae inserted about one-fourth from apex of rostrum; scape the length of funicle, the latter with long golden hairs on one side, two basal joints elongate; club ovate, about the length of first joint of funicle. Prothorax subconical, sides strongly rounded; with crowded punctures, each containing and usually concealed by a scale. Scutellum distinct. Elytra with outlines continuous with those of prothorax, base trisinuate; with rows of large, partly concealed punctures, the interstices separately convex only towards sides, and each with a row of small setiferous granules. Under surface (including metasternal episterna) with crowded punctures. Two basal segments of abdomen large and slightly flattened in middle. Femora stout, the front ones feebly grooved and strongly and acutely dentate, the others more distinctly grooved but much less acutely dentate; tibiae compressed, the front and middle ones moderately curved, the middle ones with a slight projection near the outer base. Length, 8-11 mm.

♀. Differs in having the rostrum shorter, thinner, dilated to base itself, with squamiferous punctures only about base, elsewhere polished and almost or quite impunctate, and without a median ridge; antennae shorter, inserted one-third from apex of rostrum, funicle without special clothing, prothorax more dilated about middle, and more suddenly narrowed towards apex, abdomen evenly convex and legs somewhat shorter.

Lord Howe Island (A. M. Lea and wife).

An elliptic species, readily distinguished from all others of the genus by the long golden clothing on the funicle of the male. The scales are mostly of a buff colour, or pale rusty-brown, with some small irregular white patches on the basal half of elytra and sides of prothorax; there is a conspicuous round dark patch on the middle of the elytra, the patch occupying the median third in length, and the median half in width, its outline is quite circular, but some parts of it are darker than others; but on one male the patch (except posteriorly) is not much darker than the adjacent parts. The setae are mostly white and pressed flat amongst the scales. The facets of the eyes are larger than usual in the genus, but they can hardly be regarded as coarse.

Tepperia bicrucicollis, n. sp.

♂. Black, antennae and tarsi reddish. Densely clothed with dark brown and black scales, conspicuously variegated with white, the latter forming a cross on each side of prothorax, and a postmedian fascia on elytra.

Head with crowded, concealed punctures and a narrow interocular impression. Eyes large and with coarse facets. Rostrum rather wide, feebly curved, slightly shorter than prothorax, sides gently incurved to middle; with crowded punctures, coarser and partly concealed on basal half; with a short, shining, median line. Antennae inserted slightly nearer apex than base of rostrum, scape slightly shorter than funicle, first joint of the latter elongate, club elliptic-ovate, the length of six preceding joints combined. Prothorax distinctly transverse,

sides strongly rounded, and then rapidly narrowed to apex; with crowded, concealed punctures. Scutellum distinct. Elytra oblong-cordate, considerably wider than prothorax, sides parallel to beyond the middle; with rows of large punctures, appearing much smaller through clothing; third, fifth, and seventh interstices elevated above the others. Under surface with crowded, irregular punctures, forming an irregular row in middle of each metasternal episternum. Femora stout, grooved and moderately dentate. Length, 5·5-6·5 mm.

♀. Differs in having smaller eyes, rostrum less stout, and with smaller and less crowded punctures, less of the base clothed, and abdomen evenly convex, instead of the basal segment flat in middle.

New South Wales: Warrah, in galls on the kurrajong in December, Willow Tree in November (W. W. Froggatt), Mudgee (Dr. E. W. Ferguson).

Smaller than the two previously known species of the genus *(T. sterculiae* and *major)*, and readily distinguished by the two white crosses on the pronotum. The facets of the eyes are rather coarse, but the species is so obviously allied to the other described ones, and lives on the same food plant, that it is not desirable to propose a new genus for its reception. In addition to the dark-brown scales, there are some rusty-brown ones, which form a conspicuous spot on the head; on the prothorax of most specimens the white scales are almost confined to a narrow and irregular but sharply defined cross on each side, but on four of those before me there is a narrow medioapical spot; on the elytra they form a rather wide fascia at the summit of the apical slope, and a rather wide space, on the suture beyond it to the apex, is clothed with white and rusty scales, under surface and legs with black, pale buff, and white scales, the latter mostly condensed to form spots, of which there are many on the abdomen.

Tapinocis abundans, n. sp.

♂. Dark brown, antennae paler. Densely clothed with soft, pale brownish-grey scales, more or less variegated with darker brown and black; in addition with whitish and blackish setae forming fascicles.

Rostrum moderately curved, not quite the length of prothorax, apical half shining and with numerous punctures, basal half densely clothed. Antennae inserted very slightly nearer base than apex of rostrum, first joint of funicle almost half the length of scape. Prothorax subconical, base bisinuate and almost twice the width of apex, surface somewhat uneven but not tuberculate; with crowded, normally concealed punctures. Scutellum small. Elytra closely applied to prothorax, and shoulders slightly clasping its hind angles, sides rather strongly rounded to beyond middle and then coarctate to apex; striate-punctate, striae distinct, punctures large but normally appearing small or quite concealed; second interstice with a short setose ridge before middle, third with one near base, fourth with an elongate median one about one-third of the length of elytra. Basal segment of abdomen flattened in middle, with a feeble median depression, continued on to second. Femora feebly dentate. Length, 3·5-5·5 mm.

♀. Differs in having the rostrum longer, thinner, punctures smaller, with less of its base clothed, and antennae inserted somewhat nearer its base, two basal segments of abdomen larger, and evenly convex; and legs slightly shorter.

Lord Howe Island (A. M. Lea and wife); abundant.

Differs from the generic diagnosis in having the antennae inserted slightly nearer base than apex of rostrum, and in having all the femora slightly dentate (the teeth, however, could be easily overlooked). The mesosternal receptacle on the male has the upper edge of its base slightly curved forwards, so that it could fairly be regarded as slightly cavernous, as on others of the genus, but on the female it is thinner and erect, so that the receptacle is open. Specimens are normally so densely clothed that (except for parts of the rostrum) the derm is everywhere concealed, but after abrasion it is seen to be dark reddish-brown,

some parts darker than others; on some specimens the rostrum is blackish, the club is usually darker than the rest of the antennae. The scales are large, soft, and round, but they are so dense and closely applied to the derm that it is only on parts of the under surface that they are at all distinct individually; they are mostly pale brownish-grey, in places stained with brown, but on some specimens there are small blackish spots, these being distinct on a medio-basal part of the pronotum; on the elytra, of some specimens, there is a large, square, medio-basal black patch, on others there is a large patch between the seventh interstice and each side, on several basal and lateral patches are all present and connected; but on most the blackish spots are small and isolated, or absent. On several examples some of the elytral scales have a faint greenish or purplish gloss. On most specimens some black setae on the pronotum are compacted to form two feeble median fascicles, and sometimes a still more feeble one on each side; on the elevated parts of the elytra some of the setae are also compacted to form fascicles, but as the elevations vary in height, and the setae in colour and density, they are much less distinct on some specimens than on others. Three were obtained on the summit of Mount Gower.

Tapinocis setosus, n. sp.

♂. Black or blackish-brown, antennae and tarsi more or less reddish. Densely clothed with brownish scales, in places somewhat variegated; and interspersed with numerous pale and blackish setae, in places compacted to form fascicles.

Rostrum about the length of prothorax, moderately curved; apical half glabrous and with numerous, sharply defined punctures, elsewhere squamose. Antennae inserted slightly nearer base than apex of rostrum, first joint of funicle almost half the length of scape. Prothorax moderately transverse, sides rather strongly rounded; with crowded punctures. Scutellum small. Elytra subcordate, sides rather strongly rounded; striate-punctate, the striae distinct, but the punctures, although large, mostly concealed; some of the interstices uneven. Femora edentate. Length, 3·5-4·0 mm.

♀. Differs in having the rostrum longer, thinner, more of it glabrous, with smaller punctures and antennae inserted nearer the base, and abdomen with two basal segments of abdomen larger and more convex.

Norfolk Island (A. M. Lea); five specimens.

The mesosternal receptacle is briefly U-shaped and slightly cavernous, as on most species of the genus. The scales on the pronotum are large and soft, and each is pressed down in the middle, indicating the puncture it covers, but the punctures themselves are normally concealed; on the elytra there are feeble spots, or oblique vittae, where the scales are blackish, or at least deeply infuscated. On the pronotum the setae are numerous, but do not form distinct fascicles; on the elytra they are more irregular and form feeble ones, of which the more distinct are four, or six (usually dark), across the basal fourth, and six (usually pale), crowning the apical slope. From directly above the shoulders are seen to slightly clasp the prothorax, but from behind they appear to be completely rounded off, and the elytra to be regularly cordate.

Tapinocis constrictus, n. sp.

♂. Dark brown or black; rostrum, antennae, and tarsi more or less reddish. Densely clothed with soft brown scales, varying in places almost to white and black; interspersed with numerous, short, erect setae, also varying in colour, and in places compacted to form fascicles.

Rostrum moderately curved, about the length of prothorax, polished and minutely punctate, except near base, which is densely clothed. Antennae inserted

about two-fifths from base of rostrum, two basal joints of funicle the length of scape. Prothorax moderately transverse, base bisinuate, sides strongly rounded; with crowded, normally concealed punctures. Scutellum absent. Elytra subcordate, base no wider than base of prothorax, sides rather strongly rounded; striate-punctate, striae well defined, but punctures concealed posteriorly. Metasternal episterna disappearing in middle. Femora edentate. Length, 4 mm.

Lord Howe Island (A. M. Lea); unique.

The antennae inserted nearer base than apex of rostrum, episterna disappearing in middle (the ends represented by small triangles) and absence of scutellum, are aberrant features in the genus; but the type being a female, and agreeing in most of its generic features with females of the genus, it was not considered advisable to propose a new one for its reception. On the pronotum most of the scales have a somewhat smoky appearance, but a large medio-basal patch is fawn coloured; on the elytra there is a subtriangular whitish patch in the scutellar region, but most of the scales are smoky (in some lights appearing obscurely greenish), except on the sides, where they are mostly fawn coloured; on the under parts of the body and of the legs they are mostly whitish. On the pronotum the setae are numerous, but although in parts somewhat congested, they do not form fascicles; on each elytron there are three blackish fascicles on the third interstice (one at the basal fourth is more distinct than the others) and two feeble ones on the fifth (of which one is at the base). The curvature of the sides of the prothorax and elytra is such that they appear to be rather strongly constricted at their junction.

Tapinocis humeralis, n. sp.

♂. Black, antennae and tarsi reddish. Densely clothed with blackish scales, obscurely variegated with somewhat paler ones, but with a conspicuous buff patch on each shoulder. With short erect setae, compacted to form numerous fascicles.

Rostrum rather stout, moderately curved, slightly shorter than prothorax; with coarse crowded punctures, concealed by scales near base. Antennae inserted slightly nearer apex than base of rostrum, two basal joints of funicle slightly shorter than scape. Prothorax moderately transverse, base almost truncate, and almost twice the width of apex, sides strongly rounded, with crowded, partly concealed punctures. Scutellum small, but slightly elevated above the adjacent parts. Elytra at base feebly multisinuate, sides rounded and widest at basal third, irregularly striate-punctate, punctures only partly concealed, interstices irregular and uneven beneath fascicles. Mesosternal receptacle briefly U-shaped, base stouter than usual. Abdomen with crowded punctures, basal segment depressed in middle, the length of the three following combined. Femora feebly grooved and edentate. Length, 5·5-6·0 mm.

Western Australia: Perth (H. M. Giles); two males.

Structurally close to *T. corticalis*, but with third and fourth segments of abdomen shorter and with wider sutures, and mesosternal receptacle with a larger base. The humeral patches of pale scales are very conspicuous. Both specimens have the abdomen almost glabrous, but this may be due to abrasion. On the pronotum the fascicles are rather feeble, there are four across the middle, two very feeble ones at apex, and four, still more feeble, near base; on the elytra the fascicles are more conspicuous; there are four or five on each of the third, fifth, and seventh interstices, and small ones on the intervening ones, and on the suture on its apical half. The genus is now first recorded from the mainland.

Idotasia and Australian Allies.

There are so many genera allied to *Idotasia* in New Guinea and adjacent islands that are unknown to me in nature, that a table to include them from

published characters only would probably be misleading. The following table, however, which deals only with Australian ones, may be of use:—

A. Basal segment of abdomen with a space bounded by an impressed line or ridge; hind femora strongly dilated.	
a. Club of antennae long	*Amydala*
aa. Club at most of moderate length	*Ampagia*
AA. Basal segment without a special line; hind femora not very wide.	
B. Mesosternal receptacle more or less cavernous.	
b. Scutellum present.	
c. Femora feebly grooved and strongly dentate	*Hoplidotasia*
cc. Femora strongly grooved and feebly dentate	*Alatidotasia*
bb. Scutellum absent.	
d. Metasternum moderately long	*Idotasia*
dd. Metasternum short	*Ampagiosoma*
BB. Mesosternal receptacle open.	
C. Scutellum absent	*Tropidotasia*
CC. Scutellum present.	
D. Prosternum unusually short in front of coxae (not half the length of coxae)	*Apatidotasia*
DD. Prosternum in front longer than front coxae.	
E. Rostrum parallel-sided, scrobes invisible from directly above	*Leucomelacis*
EE. Rostrum dilated in middle, scrobes partly visible from above	*Rhinidotasia*

Idotasia.

In my revision of the Australian Cryptorhynchides the species of this genus were noted [4] as having the femora edentate and the metasternum longer than the basal segment of abdomen. The genus is abundantly represented in New Guinea (where the species attain their maximum size), is fairly numerous in the coastal strip from the Clarence River in New South Wales, to North Queensland, and occurs in New Caledonia, Fiji, and New Zealand. Some of the ex-Australian species agree in the metasternum and femora with the above noted Australian ones, but others differ; some recently examined Australian species also have the metasternum somewhat shorter than the basal segment of abdomen (although not as short as in *Ampagiosoma)* and some have dentate femora; the tooth, however, appears more as a sudden termination of the ridge bounding the groove than as a special process.

Idotasia sculptirostris, n. sp.

Black, shining. A few white scales on head, rostrum, and under parts, and forming marginal lines on femora.

Head with small punctures in front, elsewhere almost impunctate. Rostrum stout, moderately curved; with four rows of squamiferous punctures, alternated with fine carinae. Antennae rather stout, scape short, inserted almost in middle of rostrum, and about the length of club. Prothorax conical, base wide and truncate; with small but sharply defined punctures, not very close together, even at apex, and becoming larger but not coarse, on sides near legs. Elytra with outlines continuous with those of prothorax, widest at basal third, sides thence coarctate to apex; with regular rows of small and rather distant punctures, becoming dense and irregular about apex. Under surface with irregularly distributed punctures; metasternum slightly shorter than the following segment. Femora strongly grooved, front ones distinctly dentate, the others edentate. Length, 2·75 mm.

Queensland: Dunk Island (H. Hacker). Type, in Queensland Museum; cotype, in South Australian Museum.

(4) Lea, Proc. Linn. Soc. N.S. Wales, 1912, p. 608.

About the size of *I. laeta*, but prothoracic punctures much smaller and elytra with distinct series of rather widely spaced ones, the marginal row, however, consists of fairly large ones close together. The other described species, *I. evanida*, *aequalis*, and *albidosparsa*, are all larger, and differ considerably in the punctures of the upper surface. The tooth on each front femur is more the abrupt termination of a ridge, rather than a true isolated one. On several specimens the antennae and legs are obscurely diluted with red.

Idotasia striatipennis, n. sp.

Dark brown, scape somewhat paler. Irregularly clothed with stout white scales, and with a few dark, erect setae.

Head with rather dense, partially concealed punctures in front. Rostrum moderately long, gently curved, dilated near base, parallel-sided elsewhere; with rows of punctures alternated with slight ridges, concealed by clothing near base. Antennae inserted nearer base than apex of rostrum, scape short. Prothorax subconical, sides gently rounded, base subtruncate and more than twice the width of apex; with rather small and fairly numerous punctures, mostly concealed. Elytra conjointly elliptic with prothorax; with narrow, deep striae containing punctures; interstices with minute punctures. Metasternum, along middle, as long as the following segment, which is flat in middle. Femora strongly grooved and edentate. Length, 2·75 mm.

Queensland: Stradbroke Island (H. Hacker). Type (unique), in Queensland Museum.

An elliptic species with striated elytra suggestive of *Alatidotasia*, but without a scutellum. The scales have a loose appearance, but probably have been abraded, they are dense on the apex and sides of prothorax, base of rostrum, and most of under surface, and fairly dense on parts of elytra; the few setae are distinct only from the sides. The type appears to be a male.

Idotasia squamosa, n. sp.

Blackish-brown, antennae paler. Densely clothed with white and chocolate-brown scales, white only on under surface, rostrum, and legs.

Rostrum almost straight, sides dilated near base; with rows of squamiferous punctures alternated with feeble ridges, but concealed towards base. Antennae inserted slightly nearer base than apex of rostrum. Prothorax subconical, base truncate and much wider than apex; punctures dense but normally concealed. Scutellum absent. Elytra with sides conjointly elliptic with those of prothorax, widest near base; with narrow, deep striae, containing punctures, but partly concealed. Metasternum along middle slightly shorter than the following segment, very narrow between coxae. Femora grooved and edentate. Length, 2·75 mm.

Queensland: Caloundra, in January and September (H. Hacker). Type, in Queensland Museum; cotype, in South Australian Museum.

Readily distinguished from all previously described Australian species by the bicoloured clothing of the upper surface. The white scales are dense on the apex of prothorax, and form a basal zone (interrupted in middle) and numerous spots or interrupted fasciae on the rest of the elytra. The mesosternal receptacle is strongly elevated and pushed forwards so that no part of it is actually between the middle coxae.

Idotasia rostralis, n. sp.

♂. Black, antennae reddish. With irregularly distributed white scales.

Rostrum arched and dilated at base, almost parallel-sided elsewhere; with coarse, squamiferous punctures, becoming partly concealed near base; with a conspicuous and almost continuous median carina. Antennae inserted nearer base than apex of rostrum, scape scarcely longer than the two following joints

combined; club comparatively small. Prothorax with moderately rounded sides, base truncate and twice the width of apex, with numerous (but not dense) minute, sharply defined punctures. Elytra with rows of very minute punctures, but with a basal row of large ones. Two basal segments of abdomen with a large depression common to both, but mostly on second one. Femora grooved and edentate, tibiae longer and thinner than usual. Length, 3·5 mm.

♀. Differs in having the rostrum thinner, carina confined to the basal third, punctures beyond it smaller and naked, antennae inserted somewhat nearer the base of rostrum, and the abdominal depression much smaller, and confined to the second segment.

Torres Straits (H. J. Carter).

The elytra have somewhat similar punctures to those of *I. albidosparsa,* but the rostrum is longer, and the front sides of the rostrum are squamose; the size also is larger; on *I. aequalis* and *I. evanida* also, the sides of the prothorax are not clothed. The eyes are considerably larger than in any previously named Australian species. The upper parts of the prothorax and elytra are glabrous, but the sides of the former are rather densely squamose, white scales are also numerous on parts of the under surface and legs. The rows of punctures on the elytra are very minute, and could be easily overlooked.

Idotasia cribricollis, n. sp.

♂. Dark castaneous-brown, prothorax usually darker. Upper surface glabrous except for two narrow spots of white scales near apex of elytra, under surface and legs sparsely clothed, but middle and hind femora each margined on the upper edge with white scales.

Head smooth at base, with coarse punctures in front. Rostrum rather strongly arched near base, sides gently incurved to middle; with rows of coarse punctures, alternated with narrow ridges to apical fourth, denser but not seriate in front. Antennae inserted slightly nearer base than apex of rostrum, scape short, not much longer than club. Prothorax moderately transverse, sides almost parallel to near apex; with dense, large, round, and deep, but not confluent punctures. Elytra very little wider than prothorax on basal fourth, thence strongly narrowed to apex; with rows of small and sharply defined but rather widely spaced punctures, larger at base, crowded on tips. Abdomen narrow, two basal segments large, with a wide and rather deep excavation common to both, and continued to metasternum. Femora strongly grooved and edentate. Length, 2-3 mm.

♀. Differs in having the rostrum thinner, its apical half smooth and with much smaller punctures, and abdomen not excavated.

Fiji: Viti Levu, Ovalau, Taveuni (A. M. Lea); abundant.

The mesosternal receptacle is curved and slopes upwards from its base. On typical species of *Idotasia* it is suddenly and strongly elevated and the emargination is shorter, but as the femora are deeply grooved, the metasternum comparatively long, and the abdomen of the male excavated, it seeems better to regard this (and the following) Fijian species as belonging to an aberrant section of *Idotasia,* rather than to a new genus. The subapical spots of white scales are readily abraded. Except for the rounding off of its front angles the prothorax of the male, which is unusually large, is almost transversely oblong; its dense and large punctures are in striking contrast with the small and distant ones on elytra. On several specimens the elytra are almost bright castaneous, on others the upper surface is almost entirely blackish; the specimens from Taveuni are three rather large males, and have the elytra narrowly infuscated at both base and apex.

Idotasia humeralis, n. sp.

♂. Reddish-castaneous; each shoulder with a large, black, rounded humeral spot, touching the base and side, but not the suture. With a few whitish scales on the upper surface, becoming more numerous on the under surface and legs.

Head, rostrum, and antennae as described in preceding species. Prothorax almost as long as wide, sides feebly dilated to near apex, and then rounded to apex itself; with numerous sharply defined punctures of moderate size. Elytra elongate, base truncate, sides rather strongly rounded near base and then oblique to apex; with rows of rather distantly placed punctures, not much smaller than those on prothorax, and becoming crowded about apex. Two basal segments of abdomen with a large median excavation. Femora strongly grooved and edentate. Length, 2·75-3·25 mm.

♀. Differs as in the preceding species.

Fiji: Viti Levu (A. M. Lea).

Decidedly narrower than the preceding species, and prothoracic punctures smaller and less crowded, although quite sharply defined; there are also a few scales (some of which are almost ochreous) scattered about on the upper surface. The hind femora are partly margined with white scales, and there are two small spots near the apex of the elytra, but they appear to be easily abraded. The humeral spots are very conspicuous.

var. posthumeralis, n. var.

Four specimens, from Viti Levu, differ in having a round black spot at the basal third on each elytron, completely isolated from the base and side, as well as from the suture.

var. immaculata, n. var.

A single male, from Viti Levu, has the base and apex of elytra feebly infuscated, but the humeral spots are completely absent.

Hoplidotasia, n. g.

Eyes moderately large, with fine facets. Rostrum rather wide, gently curved. Antennae inserted slightly nearer base than apex of rostrum, scape short, first joint of funicle moderately long, club short. Prothorax and elytra strongly convex, their sides incurved at their junction. Scutellum small. Pectoral canal deep. Mesosternal receptacle raised in front, emargination rather widely U-shaped, cavernous. Metasternum in middle shorter than second segment of abdomen. Two basal segments of abdomen large. Femora stout, feebly grooved and strongly dentate, tibiae arched at base, front ones bisinuate on lower edge.

The only previously named Australian genus, with a scutellum, allied to *Idotasia*, is *Alatidotasia*, all the species of which have the outlines of prothorax and elytra continuous, the latter distinctly although finely striated, their femora thinner and minutely dentate, and with ample wings. On the species of this genus the sides are incurved at the junction of the prothorax and elytra, and the wings are mere remnants, scarcely the length of the prothorax, with a median vein only, and quite useless for flight. The sexual differences in the rostrum and antennae are not very pronounced.

Hoplidotasia torresensis, n. sp.

Blackish, some parts (including antennae) obscurely reddish. White scales at base of rostrum, forming two narrow spots on each elytron, and fairly dense on parts of under surface and of legs; head, prothorax, and femora with inconspicuous blackish scales.

Rostrum slightly shorter than prothorax; with coarse, partly concealed punctures about base, small elsewhere. Prothorax slightly shorter than the basal

width; with fairly dense, sharply defined punctures of moderate size. Elytra at base (which is slightly upcurved) just perceptibly wider than base of prothorax, sides rounded and widest at basal third; with regular rows of isolated punctures, about as large as on pronotum (but a transverse row of larger ones at base). Length, 4 mm.

Torres Straits: Yama and Cornwallis Islands (C. T. McNamara).

At first glance the species appears to belong to *Diomia,* but on that genus (from New Guinea) the mesosternal receptacle is widely open. On each elytron the white spots are on the third interstice near apex, and on the seventh, about middle; the femora are conspicuously outlined in white. On the four specimens from Yama Island the only white scales on the prothorax are some close to the coxae; but on each (of two) from Cornwallis Island there are three conspicuous spots, although loosely compacted, one in the middle and one on each side.

HOPLIDOTASIA, sp.

A female from Fiji (Viti Levu) belongs to this genus. Its hind femora are feebly grooved and very feebly dentate, but as the other legs are missing, and it is partly abraded, it is undesirable to name it. In general appearance it is close to the Yama Island specimens, except that the prothoracic punctures are larger and closer together, much as on the Fijian *Idotasia cribricollis,* from which it differs in several generic features.

Tropidotasia, n. g.

Eyes round and with fairly large facets. Rostrum rather wide and feebly curved. Antennae inserted near apex of rostrum. Prothorax subconical, with a continuous median carina. Scutellum absent. Elytra with outlines continuous with those of prothorax. Pectoral canal deep, wide, and open posteriorly. Legs long, femora dentate, tibiae thin. Elliptic, strongly convex.

The type is a small, strongly convex insect, with the general appearance of *Ampagiosoma,* but with the pectoral canal open posteriorly, a character in which it differs from *Idotasia* and all its previously known Australian allies. There are, however, several genera from New Guinea, and some new Australian ones in which it is open, but in a different way.

Tropidotasia femoralis, n. sp.

♂. Black; parts of elytra obscurely reddish, their sides with a faint bluish gloss; antennae, tarsi, parts of tibiae, and apical segment of abdomen reddish. Irregularly clothed.

Head with crowded punctures. Rostrum slightly shorter than prothorax, with five acute carinae to apical third, which is shining and with minute punctures. Prothorax wider than long, base truncate and twice the width of apex, sides rapidly diminishing from base to apex, but with a slight incurvature near apex; with crowded punctures of moderate size, in places longitudinally or obliquely confluent, median carina acute and not interrupted by a subapical transverse impression. Elytra widest at about basal third, with rows of rather large punctures, somewhat variable in size. Apical segment of abdomen large, with a shallow median depression and with dense punctures. Femora with dense punctures in well-defined but irregular striae, front pair dilated from apex to basal third, and then strongly incurved to base, tooth small; middle and hind ones not dilated towards base, and with stronger teeth; tibiae arched at base, the middle and hind ones each with an angular outer projection near base.

Lord Howe Island, one specimen from sieved fallen leaves (A. M. Lea).

One of the most interesting of the many interesting weevils from the island. The obscurely reddish parts of the elytra are the base, suture, and a curved

median space, but it is probable that they are not constant. The clothing of the upper surface may be partly abraded, it consists of loose whitish scales, mostly on the reddish parts; but on the under surface the clothing, which has a woolly appearance, is so dense on the mesosternum, metasternum, and abdomen (except on the apical segment) that their sutures are completely concealed, it is even denser in the pectoral canal. Faint striae are traceable on parts of the elytra, but the punctures are mostly isolated in their rows. The tooth on each front femur could be easily overlooked.

Apatidotasia, n. g.

Eyes rather large, close together, and with fairly large facets. Rostrum not very thin and moderately curved. Antennae thin, inserted near apex of rostrum, scape almost as long as prothorax and elytra combined, club small. Prothorax small, base much wider than apex and both truncate. Scutellum small. Elytra subcordate, much wider than prothorax. Prosternum very short in front of coxae, pectoral canal deep but rather narrow, its apex open. Metasternum along middle, where it is produced between the middle coxae, slightly longer than the following segment. Two basal segments of abdomen large, the suture between them almost obliterated in middle. Legs moderately long, femora dentate. Body winged.

The elytra are wider in proportion than on most of the allies of *Idotasia*. The part of the prosternum in front of the front coxae is very short (much shorter than in *Leucomelacis)*, but is grooved along the middle, the groove with distinct walls. The process between the middle coxae belongs to a produced portion of the metasternum, the part actually belonging to the mesosternum appears as a thin margin to it, and is vertical in front. In *Leucomelacis*, as in most of the Cryptorhynchides, the part between the coxae definitely belongs to the mesosternum. All the species are polished black, with two narrow subapical spots of white scales on the elytra, as on most of the allies of *Idotasia*. Type of genus, *A. amplipennis*.

TABLE OF SPECIES.

A. Front and middle femora edentate .. .. *imbellis*
AA. All femora dentate.
  B. Metasternum with dense punctures .. .. *parvicollis*
  BB. Metasternum with a row of very large punctures margining base.
    C. Tooth of each front femur small but acute .. .. .. *amplipennis*
    CC. Tooth very small and not at all acute .. .. *carinirostris*

Apatidotasia amplipennis, n. sp.

♂. Black, shining, scape and part of funicle reddish, rest of antennae infuscated. Elytra with two narrow subapical spots of white scales.

Rostrum slightly longer than prothorax, moderately curved, parallel-sided; with a narrow median carina to apex, and with rows of squamiferous punctures. Antennae inserted about one-fourth from apex of rostrum. Prothorax at apex almost as wide as the median length, but base much greater, sides strongly rounded, rather deeply constricted near apex, the constriction not interrupted in middle; with numerous, but not crowded, and rather small, sharply defined punctures. Elytra about once and one-half the width of prothorax, base feebly trisinuate, sides rather strongly rounded, and widest at about basal third; with regular rows of sharply defined punctures. Metasternum with a conspicuous basal row of large punctures, of which there are four on the intercoxal process. Basal segment of abdomen with a basal row of large punctures, second with a row of large ones at apex, apical segment with crowded punctures. Front femora acutely but not very strongly dentate, middle ones more strongly, hind ones still more strongly dentate. Length, 2·5-3·0 mm.

♀. Differs in being slightly more robust, with the rostrum thinner, its median carina shorter, and punctures smaller and not squamiferous.

Queensland: Murray Island (A. M. Lea), Cairns (Blackburn's collection).

In addition to the white elytral spots, white scales margin the middle and hind femora, are sparsely scattered on the under surface, and are fairly numerous on the rostrum of the male. The eyes are close together on both sexes, but are slightly more apart on the female than on the male. The elytral punctures are mostly isolated in the rows, but towards the sides and posteriorly there are faint indications of striae. The four large punctures, on the intercoxal process of metasternum, mark the corners of a square.

Apatidotasia carinirostris, n. sp.

♂. Black, scape and base of funicle reddish, rest of antennae infuscated. Elytra with two narrow subapical spots of white scales; legs, under surface, and part of rostrum with scattered white scales.

Rostrum moderately curved, slightly longer than prothorax, behind antennae (which are inserted at the apical fourth) with a narrow median carina, and rows of squamiferous punctures. Prothorax rather strongly transverse; with a narrow subapical constriction containing fairly large punctures, elsewhere the punctures are small. Elytra with somewhat smaller punctures, but otherwise much as in the preceding species. Under surface with irregular punctures, but large ones forming rows at base of metasternum and of first segment of abdomen, and a row on second segment. Front femora very feebly, the others acutely dentate. Length, 3·5 mm.

Queensland: Cairns district (A. M. Lea); unique.

Close to the preceding species, but slightly larger and front femora very feebly dentate, the feeble ridge on one side of the feeble groove ends abruptly, but the end is not produced in a tooth-like form as it is on the others, where each tooth is acute and distinct; the elytral punctures are also somewhat smaller.

The elytral punctures are really small, but owing to "waterlogging" (as on many specimens of *Cordus hospes*) from some directions they appear to be very close together (both in the rows and transversely) and each to have a small central pit (the true puncture). This appearance, however, occurs on specimens of so many species of weevils, that no reliance can be placed on it.

Apatidotasia parvicollis, n. sp.

Black, shining; scape reddish, rest of antennae infuscated. Elytra with two narrow subapical spots of white scales, very few white scales on under parts.

Rostrum feebly curved and rather wide, no longer than prothorax, behind antennae (which are inserted at apical fourth) with a median ridge and rows of punctures. Prothorax small, sides oblique, subapical constriction feeble, with numerous sharply defined punctures on sides and apical half, small elsewhere. Elytra much wider than prothorax, base trisinuate, sides rather strongly rounded; with rows of sharply defined punctures, becoming smaller posteriorly, except the sutural and marginal rows, which are in very feeble striae about apex. Femora acutely dentate, tooth of each front one smaller than the others. Length, 3 mm.

Northern Queensland (Blackburn's collection).

The shape of the metasternum is as on the two preceding species, but the punctures are more crowded and irregular, and although there are some larger ones near the base, they do not form a conspicuous row there, neither are there especially large ones on the two basal segments of abdomen.

Apatidotasia imbellis, n. sp.

Black, shining; antennae almost black. With a few white scales scattered about on the under parts, but with two narrow subapical white spots on the elytra.

Rostrum slightly longer than prothorax, behind antennae (which are inserted at the apical fourth) with a median carina and four rows of punctures. Prothorax small, sides oblique and but feebly rounded; with distinct punctures on sides, but feeble elsewhere. Elytra cordate, much wider than prothorax, base very feebly trisinuate; with rows of fairly large, sharply defined punctures, those in the inner rows becoming smaller posteriorly. Under surface with irregular punctures, but metasternum and abdomen each with a basal row of large ones. Hind femora acutely dentate, the others edentate. Length, 2·2-2·4 mm.

Queensland: Cairns district (A. M. Lea).

The smallest species of the genus, but readily distinguished by the edentate front and middle femora, the tooth on each hind femur, although small, is sharply defined. The eyes, although not widely separated, are not as close together as on other species of the genus. There are some suberect black setae on the upper surface, but they are distinct only from the sides.

A specimen from Northern Queensland (Blackburn's collection) has the scape distinctly reddish, and is without subapical spots on the elytra, but these have probably been abraded, as there is one white scale on the right side. Its femora are as in the Cairns specimens.

Leucomelacis, n. g.

Head small. Eyes with facets of moderate size. Rostrum long, thin, parallel-sided, and moderately curved. Antennae thin, scape as long as funicle and club combined, club small. Prothorax subconical. Scutellum small. Elytra subcordate, wider than prothorax, but shoulders rounded off. Pectoral canal deep and rather wide, but narrowed between front coxae, open posteriorly. Metasternum along middle about the length of the following segment; episterna well defined. Abdomen with basal segment about as long as fifth, and almost as long as second and third combined, second to fourth with suture drawn backwards at sides. Femora stout and dentate, tibiae thin and arched at base.

The pectoral canal is deep and sharply defined, and the intercoxal process of the mesosternum is depressed below the coxae (the insect viewed on its back) and is faintly depressed in its middle (as on many species of *Melanterius* and allied genera), as a result most of the inner parts of the middle coxae are exposed. In *Tropidotasia* the mesosternal receptacle is practically on a level with the coxae and is emarginate in front; on that genus the metasternal episterna are partly concealed, on this genus they are narrowed to the apical triangles, but are distinct throughout. The curvature of the abdominal segments is aberrant amongst the allies of *Idotasia*. On each side of the prothorax of both genera there is an oblique groove near the front coxa, as in many species of *Storeus*.[5] Type of genus, *L. quadrinotatus*.

Leucomelacis quadrinotatus, n. sp.

♂. Black, antennae reddish, club infuscated. Fourth interstice on each elytron with two narrow strips of white scales, one at base, the other near apex, head, under surface, and legs with scattered white scales.

Head with crowded punctures. Eyes separated the width of rostrum at base. Rostrum slightly longer than prothorax, behind antennae (which are inserted at apical fourth) with five narrow ridges, alternated with rows of punctures, in front with punctures only. Prothorax fully twice as wide at base as at apex,

(5) Lea, Mem. Q'land Mus., ix., April, 1927, pp. 38 and 56.

sides oblique but gently sinuous; with numerous but not crowded punctures of moderate size. Elytra widest close to base, sides thence rapidly narrowed, with a rounded outline, to apex; with rows of sharply defined but not very large punctures, in feeble striae only near apex. Under surface with crowded punctures, basal segment of abdomen with a shallow median depression. Femora acutely dentate. Length, 3 mm.

♀. Differs in having the rostrum longer and thinner, with ridges and seriate punctures only near base, and basal segment of abdomen evenly convex.

Queensland: Cairns district (F. P. Dodd); Mulgrave River (H. Hacker).

In addition to the white scales there are some black ones, but the latter are inconspicuous. The fifth row of punctures on each elytron is level with the external base of the prothorax.

Leucomelacis albohumeralis, n. sp.

♂. Black; part of antennae, tip of rostrum, and claws reddish. Each elytron with two narrow spots of white scales, one on the sixth interstice at base, the other on the fourth near apex; under surface, legs, and rostrum with white scales, becoming dense on parts of metasternum and of rostrum.

Rostrum longer than prothorax, with fine ridges alternated with rows of squamiferous punctures to apical fourth (where the antennae are inserted), in front with punctures only. Prothorax and elytra with outlines as in preceding species, the punctures slightly larger. Femora acutely dentate. Length, 3 mm.

Northern Territory: Melville Island (W. D. Dodd); unique.

Structurally close to the preceding species, but the white basal spot is on the sixth interstice instead of on the fourth; the second segment of the abdomen is also slightly smaller.

Rhinidotasia, n. g.

Head small. Eyes frontal, close together and with coarse facets. Rostrum rather long, moderately curved, slightly dilated in middle; scrobes oblique, and partly visible from above. Antennae inserted about one-third or one-fourth from apex of rostrum, scape about the length of funicle, first joint of the latter stout and rather long, club rather small. Prothorax subconical, truncate in front. Scutellum distinct. Elytra subcordate, outlines continuous with those of prothorax. Pectoral canal deep and rather wide, scarcely encroached upon by front coxae, open posteriorly. Metasternum in middle slightly longer than the following segment; episterna distinct. Abdomen with distinct sutures, first segment as long as second and third combined, second to fourth curved backwards at sides. Legs of moderate length, femora dentate or not.

In many respects, and especially in the sterna, this genus approaches *Leucomelacis,* but on the species of that genus the scrobes are invisible from above. The most readily seen distinguishing feature (although not of generic importance) is the clothing of the elytra, on the species of that genus there are two subapical white spots, as on most of the allies of *Idotasia;* on the species of this genus there is only one subapical spot or strip of white scales, and that is on the suture. In most genera of the subfamily the rostrum is either parallel-sided, or slightly incurved to the middle, but on the species of this genus the part below the scrobe on each side is somewhat dilated so that the scrobe itself is quite distinct from directly above, when the antenna is drawn out; even when the antenna is resting in its scrobe its point of attachment is quite distinct. The separation of the eyes is less than half the width of the rostrum at base in the female, and still less in the male. The mesosternum is very short, with each side of the receptacle produced as a small conical tubercle (much as on many species of *Melanterius);* it appears as a narrow attachment to the intercoxal process of the metasternum. The third and fourth abdominal segments

are larger than usual, their combined length being distinctly more than that of the second segment. Type of genus, *R. suturalis*.

TABLE OF SPECIES.

A. Femora dentate	*suturalis*
AA. Femora edentate.	
B. Elytra with rows of comparatively small punctures	*edentata*
BB. Elytra with rows of rather large punctures	*cribrosa*

Rhinidotasia suturalis, n. sp.

Black, shining; tip of rostrum, parts of antennae and of tarsi reddish. Whitish scales on sides of rostrum, parts of under surface and of legs, and forming a distinct narrow spot on the suture near apex.

Rostrum slightly longer than prothorax; with squamiferous punctures on sides from base to antennae, small and sparse elsewhere; about half the length of scrobes visible from directly above. Prothorax widely truncate, base about twice the width of apex; sides oblique, with a slight incurvature near apex; with small but sharply defined punctures, becoming larger on sides. Elytra closely applied to prothorax, sides widest near base; base (except for scutellum) gently and evenly arched inwards; with sharply defined rows of small punctures, becoming larger on sides. Metasternum with irregular punctures becoming crowded on sides. Femora feebly grooved and slightly but acutely dentate. Length, 2·7-3·2 mm.

North Queensland (Blackburn's collection), Cairns (Dr. E. W. Ferguson).

On some specimens the red tip of the rostrum is scarcely evident, and on the one from Cairns only the base of the scape is reddish.

Rhinidotasia edentata, n. sp.

Black, shining; tip of rostrum and parts of antennae reddish. With sparsely distributed whitish scales, but a distinct narrow white strip on suture near apex.

Rostrum scarcely longer than prothorax, sides with squamiferous punctures between base and antennae, about half the length of scrobes visible from directly above. Prothorax and elytra with outlines and punctures as described in the preceding species. Metasternum and base of abdomen with dense and rather coarse punctures. Femora edentate. Length, 2·2 mm.

Queensland: Cairns (Blackburn's collection); unique.

In general appearance like the preceding species on a reduced scale, but the femora edentate and abdominal sutures less curved. The interocular space appears as a thin carina.

Rhinidotasia cribrosa, n. sp.

Black, shining; parts of antennae and claws reddish. Suture with a thin strip of white scales near apex.

Head with crowded punctures continued to between eyes; these rather larger and more convex than in the two preceding species. Rostrum about the length of prothorax, with crowded punctures to between antennae, smaller and sparser in front; scarcely half the length of scrobes visible from above. Prothorax distinctly transverse, base almost twice the width of apex, sides almost evenly rounded; with dense, sharply defined punctures of moderate size. Elytra wider than prothorax at base; with rows of rather large punctures, contained in striae about the sides and posteriorly, but isolated elsewhere, interstices with minute punctures. Metasternum with coarse, crowded punctures. Abdomen with crowded punctures on the first and fifth segments, the others each with a basal and an apical row of small ones. Femora edentate. Length, 3·75 mm.

Queensland: Bowen (Aug. Simson); unique.

With the edentate femora of the preceding species, but considerably wider and larger, with more crowded and larger punctures on the prothorax and abdomen, and larger seriate ones on the elytra; the outlines of prothorax and elytra are also not evenly continuous. There is only a remnant of white clothing on the suture, but it may have been partly abraded. The type is probably a male.

DESCRIPTION OF PLATES VII. TO IX.

(Photographs by N. B. Tindale.)

Plate VII.

Figs. 1, 2—*Poropterus posterius*, Lea.
„ 3, 4—*P. impendens*, Lea.
„ 5, 6—*P. griseus*, Lea.
„ 7, 8—*P. setipes*, Lea.
„ 9—*P. ferrugineus*, Lea.
„ 10, 11—*P. submaculatus*, Lea.
Fig. 12—*Poropterus cribratus*, Lea.
„ 13, 14—*P. angustus*, Lea.
„ 15—*P. basalis*, Lea.
„ 16—*P. sylvicola*, Lea.
„ 17, 18—*P. pictus*, Lea.

Plate VIII.

Fig. 19—*Poropterus waterhousei*, Pasc.
„ 20—*P. ellipticus*, Pasc.
„ 21—*P. sphacelatus*, Pasc.
„ 22—*P. idolus*, Lea.
„ 23—*P. alboscutellatus*, Lea.
„ 24—*P. conifer*, Boh.
„ 25—*P. variabilis*, Lea.
„ 26—*P. parryi*, Waterh.
Fig. 27—*Poropterus chevrolati*, Waterh
„ 28—*P. jekeli*, Waterh.
„ 29—*P. rhyticephalus*, Lea.
„ 30—*P. simsoni*, Lea.
„ 31—*P. rubus*, Pasc.
„ 32—*P. intermedius*, Lea.
„ 33—*P. carinicollis*, Lea.
„ 34—*P. succisus*, Er.

Plate IX.

Fig. 35—*Poropterus python*, Pasc.
„ 36—*P. morbillosus*, Pasc.
„ 37—*P. longipes*, Lea.
„ 38—*P. humeralis*, Lea.
„ 39—*P. parallelus*, Lea.
„ 40—*P. basipennis*, Lea.
„ 41—*P. verres*, Pasc.
„ 42—*P. parvidens*, Lea.
„ 43—*P. fasciculatus*, Lea.
„ 44—*P. convexus*, Lea.
„ 45—*P. rubus*, Pasc.
Fig. 46—*Poropterus conifer*, Boh.
„ 47—*P. angustatus*, Lea.
„ 48—*P. succisus*, Er.
„ 49—*P. ellipticus*, Pasc.
„ 50—*P. corvus*, Lea.
„ 51—*P. intermedius*, Lea.
„ 52—*P. astheniatus*, Lea.
„ 53—*P. constrictifrons*, Lea.
„ 54—*P. flexuosus*, Pasc.
„ 55, 56—*Psepholax pascoei*, Oll.

ORDERED ARRANGEMENT OF STONES BY ABORIGINES AT DURHAM DOWNS, COOPER'S CREEK, QUEENSLAND.

By P. D. Riddell, Broken Hill.

[Read June 14, 1928.]

Plates X. and XI.

With Messrs. E. Conrick, of Nappamerri, Cooper's Creek; S. R. Burnard, of Inverell; and A. Hetherington, of Broken Hill, I visited Durham Downs, Cooper's Creek, Queensland, in January, 1928. The object of the visit was to make some photographs of a remarkable arrangement of stones at one time used by the aborigines. The Durham Downs homestead is on Cooper's Creek, Queensland, about 500 miles north of Broken Hill, 120 miles south-west of Windorah, and 56 miles from the Queensland-South Australian border, 141·57° E. by 27·4° S. Alabena, the name by which the spot where the stones occur, is known to the surviving blacks of that district, is 11 miles north of the station. The name of the tribe occupying this territory is Unda Gnoora. The area represented by the plan (pl. x., fig. 1) is, approximately, 90 feet by 230 feet; though this appears to be only a portion of the complete ground utilized for ceremonial purposes. This Alabena ground is on the western slope of a rocky ridge 30 feet in height, with a gradual dip to a central plain, more or less level for about a mile, and covered with a sparse herbage, then, mildly undulating and moderately timbered with acacias, eremophilias, etc. A range of hills from 150 feet to 300 feet circumscribes this area, which is, roughly, from 10 to 12 miles across, commencing immediately to the east of the Alabena ground. The country is Cretaceo-Tertiary in origin. The general contour creates the impression that the area is ideally situated for the performance of a cult mystic in origin and observance.

The most interesting feature of Alabena is the number of upstanding stones, ranging in height from a few inches to 3 feet, the largest measuring more than 24 inches in diameter. The upended stones are more or less rounded at the top, some are pointed, while others appear to have been chipped to conform to the general shape. Mostly, however, the users have utilized for their purpose what Nature provided. The stones are of sedimentary origin, highly silicated. Unfortunately, many stones have been knocked out of position and broken, due to the ground being used for mustering cattle, and due to exfoliation. The action of the elements is very marked.

At the present time it is difficult to observe any definite design in the arrangement. There are two groups approximating portions of circles, while in a southerly direction towards a low range of hills, the stones indicate a lead. With Mr. Conrick, I followed this pathway, and found on the crest of these hills about every 500 yards, a cleared space from 6 feet to 8 feet in diameter, circled by stones about 18 inches high. Some were similar to those at the main ground, with the remains of a small heap of stones in the centre. We found three such cleared spaces, all similarly arranged.

To the east of the main ground, on the rocky prominence already referred to, stands a stone 41 inches high, commanding a general view of the surrounding country. There are no marks and work of any kind visible on this stone. No stone chippings, implements, or other relics of the aborigines were found, nor were any carvings or markings of any sort discovered on the stones described.

Conversation with the blacks elicited the information that associated with Alabena was a cave, also a cairn of stones. They referred also to a "big white hill." Diligent search failed to find anything suggestive of a cave or dolmen, or a cairn of stones. Mr. and Mrs. McCallagh, of Durham Downs Station, were not able to assist us, the whereabouts of a cave or a cairn of stones not being known to them. We found the "white hill," however, situated in the middle of an amphitheatre of hills, roughly half a mile in diameter, tucked away in the larger circle of hills already described. The hill is 200 feet high, of argillaceous rock, practically bare of vegetation, standing out prominently against the acacia-covered hills of equal height surrounding it.

The blacks of the Unda Gnoora tribe were disinclined to discuss Alabena, preferring me to remain silent concerning it. They undoubtedly hold it in dread, assuring me that if I touched the stones "big lumps come all over me." In conversation subsequently with Jimmie, an intelligent aborigine employed by Mr. T. Shied, of Karmona Station, I gathered that Alabena was "the spot where first blackfellow jumped up," the cairn of stones marking the spot where he was buried.

DESCRIPTION OF PLATES X. AND XI.

PLATE X.

Fig. 1. Plan of Alabena, to a scale of 11 feet to 1 inch. The dotted circles represent upended stones, while the figures against the circles give height of stones in inches.

Fig. 2. Taken from B with Camera towards X in fig. 1.

PLATE XI.

Fig. 1. Taken from C with Camera towards X in fig. 1.

Fig. 2. Taken from G with Camera towards X in fig. 1.

NOTES ON A COLLECTION OF CHITONS (POLYPLACOPHORA) FROM THE CAPRICORN GROUP, QUEENSLAND.

By Edwin Ashby, F.L.S., M.B.O.U.

[Read June 14, 1928.]

Plate XII. (in part).

Mr. W. J. Kimber has placed in my hands for description a very interesting collection of chitons made by himself during his recent visit to the Capricorn Group. While it is not a large collection, containing altogether representatives of eight species and subspecies, two of which are new, it very considerably extends the range of several, and enables one to note characters previously unrecorded in one or two little known forms.

Family Acanthochitonidae, Hedley, 1916.

Subfamily Cryptoplacinae, Thiele, 1910.

Genus *Cryptoplax*, Blainville, 1818.

Cryptoplax oculatus, Quoy and Gaimard.

Chiton oculatus, Q. and G. (Voy. "Astrol.," Zool., iii., p. 410, t. 73, f. 37, 38, 1834).

There are two examples of this *Cryptoplax* in the collection, both in excellent condition except for some erosion on the valves; both are curled, but the length if straight I should judge to be about 40 mm. The "hair-tufts," or what correspond with these in the genus *Acanthochiton*, are clearly marked and placed at the sutures, seven on each side and four in front of the anterior valve, the spicules in each of these tufts being white. Iredale and Hull (Austr. Zool., vol. 4, pt. 2, pp. 101-4, 1925) state that in their opinion this species is conspecific with *Chiton larvaeformis*, Burrow. I have in my collection an example of *C. oculatus* from Sulu, given to me by Major Dupuis, and another from an island north of Australia, given to me by Dr. J. Thiele, of Berlin; these are certainly conspecific with those collected by Mr. Kimber in the Capricorn Group. I have also two examples of *Cryptoplax larvaeformis* from Tonga Tabu given to me by Major Dupuis; the girdle clothing of these is very different from the examples of *C. oculatus*. On the evidence before me, I could not think of following Iredale and Hull in lumping the two species together.

Family Ischnochitonidae, Pilsbry, 1892.

Subfamily Callistoplacinae, Pilsbry, 1892.

(If the genus *Callistoplax*, Cpr., 1882, should be removed from this subfamily, the subfamily name would be altered to Callistochitonidae.)

Genus *Callistochiton*, Carpenter, 1882.

Callistochiton antiquus periousia, Ire. and Hull, 1925.

(*Callistelasma periousia*, Iredale and Hull, Austr. Zool., iii., 1925, 333, pl. xl., f. 8, North Queensland.)

The following is the author's definition:—"Distinguishable from *C. antiqua* by the distinctly annulate character of the nodules on the ridges of the lateral areas; the consistently broader posterior ridge; the more numerous (13 on each side) longitudinal lines in the central areas; the fine latticing so characteristic of the southern shell is present." I would add to the above, that the longitudinal

ribbing of the pleural area is shallower than *C. antiquus* and evenly nodulose, giving a granulose appearance to the ribs that is wanting in *C. antiquus*.

The girdle scales are identical with those of *antiquus* and similarly placed diagonally across the girdle. This is certainly a good subspecies, the differences being modifications of the sculpture of *antiquus*, but I cannot feel justified in allowing it full specific rank. There were several examples in the collection preserved in spirit, and, unfortunately, in several cases the valves had become detached.

CALLISTOCHITON GENEROS, Iredale and Hull, 1925.

Pl. xii., fig. 2.

(*Callistelasma generos*, Iredale and Hull, *l.c.*, f. 3, 4.)

The type was from the Capricorn Group, discovered by Hedley; in the collection under review is one dry specimen, curled, but in excellent condition, and also a nice series of curled examples preserved in spirit. The type description states "anterior valve ten-ribbed, ribs obsoletely nodulose, interstices roughly pustulose." In the example before me, in addition to the ten ray-ribs mentioned, the posterior margins of the valve are also ridged; this is shown in the figure, but in this specimen the ribs are bridged across the interstices and not pustulose, as stated in the description. Since making the foregoing note I have been able to confirm it with other specimens, and find that this feature of bridging, *i.e.*, small ridges connecting the ray-ribs, seems to be consistent but variable in degree, sometimes shallow, in other places coarse. In the median valve I also notice differences from the type description which reads as follows: "Lateral areas two-ribbed, the anterior one duplicating, subnodulose; posterior one with a succeeding line of obscure pustules." In the examples before me the duplication of the anterior rib is not consistent, the two ribs are distinctly bridged across as in the anterior valve, the posterior margin is strongly serrate, this latter constituting a striking feature in all the specimens; the statement in the description that the "jugal tract is minutely pustulose" is correct, but the added words (almost smooth) are somewhat misleading, for under 62 mag. this decussate sculpture is seen to be very sharp, and although minute, deeply cut. In the posterior valve the bridging also exists, but the mucro in the example before me is very distinct like a small pyramid; in this form, in common with other species of chitons, there is a good deal of variability both in the elevation and position of the mucro. The girdle is described as follows: "Girdle broad, scales very small, elongate, regular, 8-grooved." I should take exception to the term "very small," as compared with the scales of, say, *Ischnochiton atkinsoni*, Iredale and May, they are decidedly larger; in common with most chitons the scales near the outer edge are almost minute and increase rapidly towards the shell. The word elongate requires qualification, for these exceptionally beautiful, glassy scales are very short in the direction of the tegmentum, but laterally are very elongate, and an almost unique feature is overlooked in the type description in that the scales are sharply curved over both towards the tegmentum and towards the base, the unusually deep grooving on the scales is easily discerned with a pocket lens of 20. mag., and this easily distinguishes this species from any other Australian *Callistochiton*. Messrs. Iredale and Hull propose a new genus *Callistelasma* for the reception of all Australian *Callistochitons*, but do not attempt to compare them with what they consider to be the true *Callistochitons* or to show which are the divergent features upon which they desire to justify the proposal; under these circumstances, I do not consider we are justified in adopting their proposed new genus.

Genus *Lophochiton*, Ashby, 1923.

LOPHOCHITON GRANIFER, Hull, 1923.

(*Callistochiton granifer*, Hull, Austr. Zool., 1923, 161, pl. xxv., f. 5-8.)

One small example of this beautifully decorated species was secured. The genus *Lophochiton* was proposed by myself in 1923 because the small shell from Shark Bay, Western Australia, which I named *Lophochiton johnstoni*, was without festooning in the insertion plates and is probably intermediate between the genus *Ischnochiton* and that of *Callistochiton*, this Shark Bay species being the type of the genus *Lophochiton*. The relationship between *L. granifer*, *L. johnstoni*, *Chiton coccus*, Menke, *Callistochiton recens*, Thiele, *Solivaga recens*, of Iredale and Hull, will be dealt with in another paper.

Family CHITONIDAE, Pilsbry, 1892.

Subfamily CHITONINAE, Pilsbry, 1892.

Genus *Chiton*, Linne, 1758.

Subgenus *Rhyssoplax*, Thiele, 1893.

Chiton (Rhyssoplax) excellens capricornensis, n. subsp.

Pl. xii., figs. 1 and 13.

(*Rhyssoplax excellens*, Iredale and Hull, Austr. Zool., iv., 1926, 181, pl. xix., f. 22, 27, 40, Darnley Island, Torres Strait. Type, in Macleay Museum, Sydney. *Chiton pulcherrimus*, of Brazier, Proc. Linn. Soc. N.S. Wales, ii., 1877, 75, Iredale says not of Sowerby.)

Mr. Kimber has collected one example of a shell I am treating as a subspecies of the hitherto unique *Chiton excellens;* the specimen is dry and partly curled, measuring in this condition 14 x 9 mm. As above stated, if Iredale is correct in considering the Darnley Island specimen as non-conspecific with *C. pulcherrimus*, Sow., until this discovery of Mr. Kimber's, this species was only known from the single example in the Macleay Museum, and further, as shown later herein, if the drawings of Iredale and Hull are a correct expression of the sculpture of that shell, then the Capricorn example, although a near ally, is a distinct species, but without disarticulation and further investigation, I deem it wiser to treat it as a subspecies of *C. excellens*. This is certainly the most beautifully sculptured member of this genus.

Differentiation.—Instead of being "creamy-brown," the ground colour is creamy-white with bright-red blotches on six of the valves. The anterior valve in type is said to have "about 25 radiating, strongly nodulose ridges"; the specimen under review has 11, but between these has in one case 3 granules, in three cases 2 granules, and in two cases 1 granule, these being placed close to the girdle; these isolated granules on the outer margin may constitute vestiges of six out of the fourteen missing ribs, as the shell is in perfect condition the absence of these may be considered a racial character. In the median valve of type the lateral areas are said to have "3 bold nodulose ridges"; in this example the two outer ribs are bold, but the central one is only half the size, and varies from half to two-thirds the length; this sculpture in their figure 27 is different from the description, and in this respect corresponds more closely with the Capricorn shell; in the type description of the longitudinal ridges or ribs of the pleural area it is stated that "transverse ridges link up these longitudinals which are sharply nodulose." In the Capricorn shell the "longitudinal ridges" are not sharply nodulose, but all the 13 or 14 longitudinal ridges, except the two, in one case three, short outer ridges near the girdle are numerously bridged across, forming a coarse network pattern over fully two-thirds of this area; there is not the slightest evidence of this sculpture in their figure 40, which is drawn to a large scale with the object of expressing the sculpture of this particular portion

of the shell. If this fig. 40 is in any degree correctly drawn, then the shell from the Capricorn Group is certainly an altogether new species, and will constitute the third species of the *pulcherrimus* group.

Chiton (Rhyssoplax) kimberi, n. sp.

Pl. xii., figs. 10-12.

In the collection made by Mr. Kimber was a single example of a chiton that in outward appearance resembled the subgenus of *Ischnochiton* known as *Haploplax*, having the broadly-elliptical shape so common in *H. lentiginosus*, Sow., but rather flatter, surface without sculpture, girdle scales large and polished, but on disarticulation one was astonished to find that it belonged to the subgenus of *Chiton* s.s., and was closely related to *Chiton (Rhyssoplax) translucens.*

General appearance.—Broadly elliptical, anteriorly and posteriorly almost equally broad; colour after being in spirit "Tea Green" (Ridgway's Colour Standards, pl. xlvii.), girdle faintly banded with "Light Olive-Grey" *(l.c.*, pl. li.), shell faintly and broadly streaked and mottled with slightly darker markings, surface of shell smooth and polished, under simple lense of 20 mag. uniformly covered with faint decussate pattern, but sculpture almost if not entirely absent, lateral area raised; girdle scales very large and strongly grooved.

Anterior valve.—Measures 5·5 x 2·75 mm., is broad and shallow, unsculptured under 20 mag. except for a few broken, subobsolete growth grooves, slits 8, insertion plate beautifully and finely serrate.

Tail valve.—Measures 5 mm. x 3 mm., elevation very shallow, mucro at the anterior third, defined but not raised, the portion in front of mucro very small but shows five short, longitudinal grooves corresponding with those in the pleural areas of median valves, portion behind the mucro flat and concave, decussate pattern only perceptible under 20 mag., slits 11, insertion serrate as in anterior valve, angle of divergence 130°.

Median valve.—Measures 6·5 x 2·5 mm., lateral area indicated by a shallow, diagonal fold, and with lateral lighting, six longitudinal grooves are easily perceived crossing the pleural area, otherwise the valve under 20 mag. is unsculptured, the tegmentum is longitudinally very short but very broad laterally, elevation very shallow, the anterior and posterior margins of the tegmentum almost straight, beak subobsolete, sutural laminae broad, sinus between serrate along edge of articulamentum only, the same as in *translucens*, slit in each side, edge of teeth serrate.

Whole shell measures 14·5 mm. x 10 mm., but is slightly curved and very flat, not carinated but arched.

Girdle.—Very wide, where uncurled measures 2·5 mm. wide, and therefore occupies one-third of the total width of animal, is under a simple lens clothed with large, smooth, polished scales, but under 62 mag. the scales are seen to be decorated with widely spaced, very shallow and narrow ridges, the interspaces being wide and flat.

Body.—The gills appear to have extended the whole length of the body, but this could not be accurately determined, foot when dry measures 8 mm. in length, and head in proportion distinctly large.

Comparisons with C. translucens.—*Translucens* is an elongated shell, *kimberi* is a broad one, *translucens* is a strongly elevated shell, *kimberi* very flat; the specimen of *translucens* of which three valves are figured, measured before disarticulation 23·5 mm. x 10·5 mm., as compared with *kimberi* 14·6 mm. x 10 mm., so that they were both practically of an equal width, although so different in length; the median valve figured of *translucens* is between two and three times the elevation of *kimberi*, the

angles of divergence, *kimberi* 130°, *translucens* 90°, the sutural sinus is nearly double the width in *kimberi*, the tegmentum of the median valve slopes strongly forward in *translucens*, but is almost straight in *kimberi*, the minute decussate sculpture of *translucens* is practically absent in *kimberi*, although a minute decussate pattern is present, the grooving in the pleural area extends right across that area in *kimberi*, but is faint and grooves shorter in *translucens*, the beak which is a marked feature in *translucens* is obsolete to subobsolete in *kimberi*. I have pleasure in naming this interesting form after my friend Mr. W. J. Kimber, the discoverer, and to whose earnest collecting we are indebted for this opportunity of adding to our knowledge of several of the little known species dealt with in this paper.

Subfamily Liolophurinae, Pilsbry, 1893.

Genus *Acanthopleura*, Guilding, 1829.

Acanthopleura gemmata, Blainville, 1825.

Pl. xii., figs. 6, 7.

(*Chiton gemmatus*, Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 544. *Acanthopleura gemmatus queenslandica*, Ashby, Journ. Proc. Roy. Soc. W. Austr., vol. viii., pp. 29-31, 1921-2.)

Ashby, in "Notes on the Australian Representatives of the genus *Acanthopleura (l.c.)*, pointed out that the shell known in Australia as *A. gemmatus*, Bl., was not conspecific with *A. spinigera*, Sow., and also showed that it could not be referred to Pilsbry's subgenus *Amphitomura*, comparing it with topotypes of Pilsbry's type species, in his own collection. He then showed that examples from Dunk Island, Queensland, possessed a very different insertion plate from examples of *A. gemmatus*, from Maud's Landing in Western Australia, and suggested the subspecific name of *queenslandica* for the Dunk Island shell, with its short, laminated insertion plates in the end valves, especially the tail valve. Iredale and Hull consider the Dunk Island form conspecific with Blainville's shell, treating *queenslandica* as a synonym, giving the habitat for *gemmatus* as extending from Port Curtis, Queensland, in the east, to Bunbury, in South-western Australia. I have, personally, seen no examples taken south of a point between Carnarvon and Maud's Landing, north of Shark Bay, and should hesitate to accept Iredale and Hull's extension of the range 600 to 700 miles further southwards, without the presentation of supporting data.

The same gentlemen propose a new genus, *Acanthozostera*, for the reception of *gemmatus*, Blainville, but the definitions given are certainly below generic values; in fact, I cannot see that those advanced even justify subgeneric valuation. If the length of the teeth of the insertion plate is to be the chief ground of separation, then the western shell from Maud's Landing would have to be placed in a different genus to that of the Dunk Island shells, which seems absurd.

To quote Iredale and Hull (*l.c.*, p. 127) in their definition of the genus *Acanthopleura*: "The long teeth of the insertion plate in the anterior valve, more than half the length of the tegmentum, and the slitting (more than one) of the median valves, characterise this group *(Acanthopleura)* internally," as compared with their proposed new genus founded mainly on the shorter teeth and single slitting in the median valves. An example of *Acanthopleura spinosa*, Brug., now before me shows only one slit in median valve; it will thus be seen that the form from Maud's Landing, with its long teeth and single slit median insertion, is certainly a typical *Acanthopleura*.

Without attempting to settle the question as to which form Blainville described, or to again review the genus *Acanthopleura*, with its three sections or subspecies, proposed by Pilsbry, *viz.*, *Amphitomura*, *Mesotomura*, and *Maugeria*, which were fully discussed in paper quoted, I propose, subject to future revision, to accept Iredale and Hull's statement that the Dunk Island shell is conspecific

with Blainville's type, which is lost. I was given to understand that it was in Blainville's own private collection, which has been dissipated. I therefore indicate (subject to more accurate evidence being forthcoming) that Dunk Island is the type locality of *Chiton gemmatus*, Blainville, and now figure the end valves of type of my var. *queenslandica* as a neotype of *gemmata*, Blainville. Mr. Kimber has placed in my hands two examples from the Capricorn Group.

Acanthopleura gemmatus maudensis, n. subsp.

Pl. xii., figs. 8, 9.

The acceptance of the eastern form as typical *Chiton gemmatus*, Blainville, makes it necessary to give a name to the Maud's Landing shell. I propose to name it after the locality from which my type example has come, but until sufficient material is available from various localities along the almost untouched immense stretch of coast line along the northern shores of the continent, I suggest that it be treated as a subspecies only, although it admittedly differs in a marked degree from the eastern form.

Definitions.

Anterior valve.—Insertion plate is very broad, teeth 2·5 mm. in length, irregular, slits 12, well defined and carried to the tegmentum on the outside, but on the inside showing only for one-fifth of the length of the teeth, the teeth are almost vertical, deeply and numerously grooved on the outside, the ridges between are strong and solid, colour pale greenish-blue. In Ashby's type of his *A. gemmata queenslandica*, which will now be the pleisiotype of *A. gemmatus* s.s., the teeth are very short, in front 1 mm. in length, but increasing abruptly to slightly over 1·5 mm. at each side, slits very indistinct (I count 10), teeth denticulate at the edge, the grooves on the outside are seemingly deeper, but the ridges between are thin and more widely spaced, the insertion plate protrudes forward not almost vertical as in *maudensis*, colour of insertion brown.

Median valve.—In both forms slit 1/1, teeth grooved, colour in *maudensis* brown, shading in the sutural laminae to a bluish tinge, in the Dunk Island shell dark brown.

Tail valve.—In *maudensis*, insertion plate very broad, teeth behind mucro 2·75 mm., increasing laterally to 3·5 mm. in length, slits 9 and 2 subobsolete ones, teeth strongly serrate, the slits on the outside are carried to the tegmentum but on the inside extremely shallow, even more so than in the anterior valve, the grooving is carried up to the tegmentum but the ridges between are broader and stronger than in the anterior valve, the most marked feature is the acute angle at which the insertion plate bends forward, as near as I can measure it, is at an angle of 70°, colour of insertion plate is greenish-blue. In *A. gemmata*, the Dunk Island shell, the insertion plate is short, slits 8, continued to the tegmentum on the outside, shallow and just showing on the inside, teeth 1 mm. in length, not directed forward as in *maudensis* but although nearly vertical, bend slightly outwards, the grooves in the outside of the teeth are much more deeply cut and the ridges between comparatively thin, like lamina, and standing up well above the callousing of the inside, altogether strikingly different from *maudensis*, the colour of the insertion plate is brown.

Genus *Tonicia*, Gray, 1847.

Subgenus *Lucilina*, Dall., 1881.

Tonicia (Lucilina) shirleyi, Iredale, 1914.

(*Lucilina shirleyi*, Iredale, a new name for *Chiton pictus*, Reeve, Proc. Mal. Soc. Lond., xi., 1914, p. 131.)

Until Mr. Hull started his collecting trips up the Queensland coast, this shell was only known from three or four examples; one of these, from the collection

of the late Dr. Shirley, was sent to London, and in 1922 was handed to me to return to Shirley, but on reaching Australia I learned with deep regret that he had died during my absence, and Mrs. Shirley very generously gave me this example and a few other chitons that I had become possessed of on Dr. Shirley's behalf. Since then Hull has collected this species up the Queensland coast in considerable numbers, and he is to be congratulated on having thrown so much light on the chiton fauna of that hitherto much neglected region.

Mr. Kimber has collected two dozen specimens of this shell in the Capricorn Group. I have compared them with the shell from Bundaberg, collected by Dr. Shirley, and with two others given to me by Mr. Basset Hull from the Whitsunday Group. While the collection before me show considerable variation amongst the individuals, they are undoubtedly referable to this form. In the writer's paper "Notes on the types of Australasian Polyplacophora in the British Museum" (Trans. Roy. Soc. S. Austr., vol. xlviii., 1924), he suggested that all the Australian representatives of this genus were probably referable to three species, *T. fortulirata, T. shirleyi,* and *T. hullianus;* Iredale and Hull recognise three more, *T. rainfordiana, T. dilecta,* and *T. carpenteri.* There is no question that members of this genus vary to a large degree in the same species, from smooth to highly sculptured specimens, and until a larger series from a number of localities is available, and more intensive work has been done in this group, I should hesitate to accept the six as good species, but am not in a position to express a considered opinion.

For description of figures on pl. xii. (in part), see description of pl. xii. at the end of the next following paper.

FURTHER NOTES ON WESTERN AUSTRALIAN CHITONS (POLYPLACOPHORA).

By Edwin Ashby, F.L.S., M.B.O.U.

[Read July 12, 1928.]

Plate XII. (in part).

The following notes are the result of collecting done by the writer in October, 1927, at Nornalup Inlet, between Albany and Cape Leeuwin, and at the Quarantine Station, near Fremantle, Western Australia. Only two visits to the coast were possible at Nornalup, the first on the western side of the mouth of the inlet and the other at a little cove, a few miles further to the west. At this latter spot the collecting was most difficult owing to the heavy sea that was running. The visit to the Quarantine Station was also ill-timed, it being the only afternoon that was available, *viz.*, the 5th November, 1927. For a short time we were able to do excellent work, but the wind, which was blowing off the ocean, increased in strength rapidly, and it soon became impossible to touch the best chiton ground.

In spite of these limitations, one was able to record an addition to the known fauna of the State from both localities and to acquire such knowledge of the hitherto unsuspected habits of one of the rarest chitons endemic to Western Australia, that it will probably become comparatively common in collections.

Order POLYPLACOPHORA, Blainville.

II. Suborder PROTOCHITONINA, Ashby, 1928.

Family Acanthochitonidae, Hedley, 1916.

Genus *Acanthochiton,* Gray, em., 1821.

Acanthochiton bednalli, Pilsbry, 1894.

(*Acanthochites bednalli,* Pilsbry, Proc. Acad. Nat. Sci. Phil., 1894, 81.)

Six examples were taken at the Quarantine Station, the largest, dry, measured 22 mm. x 14 mm. I have compared these with examples in my collection from the following localities: Port Lincoln and both sides of Gulf St. Vincent, in South Australia; Portland, Williamstown, and Wilson's Promontory, in Victoria; from both northern and southern Tasmania; and I believe I have examples from New South Wales, but I have not compared these western forms with these last. While there is a little divergence in the length of the girdle fringe and in the degree of sculpture of the dorsal area, there is not the slightest doubt that the whole series is conspecific and that this species has a very extended range of habitat.

Acanthochiton kimberi, Torr, 1913.

(*Acanthochites kimberi,* Torr, Trans. Roy. Soc. S. Austr., xxxvi., 1913, 167.)

I took one example in beautiful preservation at Nornalup, and in 1920 I took three similar shells at Yallingup, all these four examples are in perfect preservation; the longitudinal grooving in the dorsal area, the grooving in the anterior valve, and the minute spicules that densely clothe the girdle, suggested that it justly deserved subspecific definition, therefore in my paper on "The Regional Distribution of Australian Chitons" (Austr. Ass. Adv. Sci., vol. 17, pp. 366-393, 1924), I proposed the subspecific name of *yallingupensis,* but on a careful re-examination I find that, making allowance for a limited amount of variability of sculpture, they are conspecific with examples in my collection

from many parts of South Australia; from Port Arthur, in Tasmania; from Vaucluse, in Sydney Harbour; collected by myself in 1923, and also two examples I collected the same year at Port Stephens, about 120 miles north of Sydney, New South Wales. Most of the examples from South Australia have lost all spicules from the girdles, but the example I took in Sydney Harbour is densely clothed with minute spicules identical with those from Western Australia; in many specimens these spicules have become detached, leaving the girdle leathery, greyish, with many circular discs with a central black spot which may be a pore. The habitat of this species is one of the most extended, starting in the Indo-Australian region, continues throughout the Adelaidean, Tasmanian, and Peronian regions. I have sent one of the Yallingup examples to Dr. Thiele, in Berlin, for comparison with his *A. deliciosus*.

Genus *Notoplax*, H. Adams, 1861.

NOTOPLAX MATTHEWSI, Pilsbry, 1894.

(*Acanthochites matthewsi*, Pilsbry, Naut., vii., 1894, 120.)

A single example was collected at Nornalup; it was on the upper side of a rock which was placed bottom side up for inspection, and thereby damaged several valves of this example. Iredale and Hull have proposed the subspecific name *occidentalis* for specimens from Middleton Beach, near Albany, on the grounds of "the more crowded linea sculpture . . . and their notably more slanting direction," and the broader and more closely lined jugal area. I find more variation between my South Australian examples than I find between one of them and the specimen from Nornalup. The same gentlemen have proposed a new genus, *Glyptelasma*, for the reception of this species and the allied form *N. glyptus*, Sykes, but have supplied no generic definition, and therefore the name *Glyptelasma* is a *nomen nudum*.

Subfamily CRYPTOPLACINAE, Thiele, 1910.

Genus *Cryptoplax*, Blainville, 1818.

CRYPTOPLAX STRIATUS, Lamarck, 1819.

(*Chitonellus striatus*, Lam., Hist. Anim. s. Vert., vi., 1819, 317.)

Four specimens were taken at the Quarantine Station, 3 dry, 1 in spirit, the largest 80 mm. in length, the others 29 mm. and 32 mm., respectively; in 1920, I suggested the name *westernensis* to distinguish a variety from Rottnest Island in which the spicules were more slender and the granulose sculpture of the juvenile stage was almost absent; these characters are not as strongly in evidence in these examples as they were in the type from Rottnest Island. Two examples were obtained at Nornalup, 1 dry, 23 mm. in length; these are equally granulose to those of the same size from South Australia.

III. Suborder LEPIDOPLEURINA, Thiele, 1910.

Family LEPIDOPLEURIDAE, Pilsbry, 1892.

Genus *Lepidopleurus*, Risso, 1826.

LEPIDOPLEURUS LIRATUS, Ad. and Ang., 1864.

(*L. liratus*, Ad. and Ang., P.Z.S., 1864, 192, Yorke Peninsula, South Australia. Type lost, exact locality unknown, probably Edithburgh.)

One example was obtained at Nornalup and three examples at the Quarantine Station. It is interesting to note that prior to these two discoveries this species has never previously been known to occur in the State of Western Australia; this record greatly extends the known range of this little chiton. These four examples show no marked divergence from the normal form; it can be easily separated from *L. profundus*, (Ashby, M.S.) May, in that in *L. liratus* the granules are distinctly granulose, whereas in *L. profundus* the granules coalesce and are flat-topped.

In "Notes and Additions to the Chiton Fauna of North-west Tasmania" (P. and P. Roy. Soc. Tas., 10th Feb., 1927, pp. 94-6), the writer explains the mishap of the prior publication by May. May figured one whole shell from Port Arthur, Tasmania, and a portion of a single valve of another shell. After conferring with Mr. F. Chapman, I now designate the whole shell figured by May, as his holotype, and the type locality will, therefore, be Port Arthur, and the example of which a portion of one valve only was figured, instead of being a cotype will be a paratype.

IV. Suborder CHITONINA, Thiele, 1910.

Family CALLOCHITONIDAE, Thiele, 1910.

Subfamily CALLOCHITONINAE, Thiele, 1910.

Genus *Callochiton*, Gray, 1847.

CALLOCHITON PLATESSA, Gould, 1846.

(*Chiton platessa*, Gld., Proc. Bost. Soc. Nat. Hist., ii., 1846, 143.)

Two examples were collected at Nornalup, one dry, measuring 12·5 mm. x 8 mm., the other in spirit; there is no specific difference between the western shells and those in the other States. I have collected it as far north as Port Stephens, and as far south as D'Entrecasteaux Channel, Tasmania.

Iredale and Hull propose a new genus, *Levicoplax*, for the Australian species, but give no definition of generic value, and do not give their grounds for the proposed separation; there appears, therefore no justification for adopting their name.

Family MOPALIIDAE, Pilsbry, 1892.

Genus *Plaxiphora*, Gray, 1847.

PLAXIPHORA ALBIDA, Blainville, 1825.

(*Chiton albidus*, Blain., Dic. Sci. Nat., xxxvi., 1825, 547, 8; *C. costatus*, Blain., *l.c.*, 548.)

Nine examples were obtained at the Quarantine Station, varying in length from 34 mm. to over 50 mm., dry and partly curled, most in excellent condition. No. 1 variety has a strongly raised, smooth, diagonal rib; the whole surface of the shell, except valve 2, is smooth except for crowded, minute, irregular lirae, which are discernable under 20 mag., valve 2 has slight evidences of coarse wrinkling. No. 2 variety is coarsely wrinkled throughout the median valves, the wrinkling being carried over the diagonal rib, giving to it a coarse pustulose or knobby appearance,

In some, the diagonal rib and wrinkling are subobsolete; the same variation is to be met with in examples of this *Plaxiphora* from Dongara, 250 miles north of Perth, southwards round the Leeuwin, eastward across the Great Bight, and the whole southern coast of Australia, in South Australia and Victoria, and right round the Tasmanian coast; in all places the same divergence exists with a little more accentuation in some localities.

If a collector desires to increase the number of species in his collection, he can put a separate tab on half a dozen variants; the truthful or scientific course is, I believe, to consider them all as representatives of one very variable species.

Genus *Kopionella*, Ashby, 1919.

KOPIONELLA MATTHEWSI, Iredale, 1910.

(*Plaxiphora matthewsi*, Iredale, Proc. Mal. Soc., ix., 1910, 99.)

I took four specimens at Nornalup, the largest measuring, dry, 27 mm. x 18 mm. This example has a strongly raised lateral area, with very strong nodulose diagonal rib and a more shallow, nodulose, raised posterior margin and wrinkled pleural area, while the next largest is the smooth form, described by Torr as

Plaxiphora hedleyi (this name can only be preserved as a variety, not as a subspecies, as I once suggested, both the costate wrinkled and the smooth form live together in the western waters), all four specimens have the peculiar "oar-head spicules" described and figured in my type description of the genus.

Family Ischnochitonidae, Pilsbry, 1892.

Subfamily Ischnochitoninae, Pilsbry, 1892.

Genus *Ischnochiton*, Gray, 1847.

Ischnochiton atkinsoni, Iredale and May, 1916.

(*I. atkinsoni*, Ire. and May, Proc. Mal. Soc., xii., 1916, 110; type locality, Penguin= (Sulphur Creek), Tasmania. *I. variegatus*, of Ire. and Hull, not of Angas; *I. atkinsoni lincolnensis*, Ashby.)

Four small examples up to 10 mm. in length were taken at Nornalup and one sent to Thiele, asking him to compare with his *I. indifferens*, from Western Australia.

Ischnochiton contractus, Reeve, 1847.

(*Chiton contractus*, Rv., Conch. Icon., iv., 1847, pl. xv.; *C. decussatus*, Rv., *l.c.*)

Not met with at Nornalup, but 14 examples collected at Quarantine Station, varying from 9 mm. to 35 mm. in length; two, about 20 mm. in length, are a delicate rose-pink, the rest are cream-white, many showing a dark dorsal streak, the sculpture shows no racial variation from the type form.

Ischnochiton iredalei, Dupuis, 1918.

(*I. iredalei*, Dupuis, Bull. Mus. Nat. Paris, 1918, 526; *I. lineolatus*, of Iredale and Hull, not of Blainville.)

A nice series of this species was collected at Nornalup, up to 40 mm. in length, the sculpture is sharper than is the case in examples from South Australia, in this respect approaching the subspecies *kingensis*, Ashby and Hull, common to both King Island and Tasmania. One striking colour variety was found, in which the dorsal areas are blotched and streaked with brown and the rest of the shell systematically blotched orange-pink and buff. Iredale and Hull designate Flinders Island as the type locality for *I. iredalei*, Dupuis, but the examples used by him were given to him by myself, and were from Gulf St. Vincent, South Australia. I have already cited this as the type locality.

Ischnochiton virgatus, Reeve, 1847.

(*Chiton virgatus*, Rv., Conch. Icon., iv., 1847, pl. xxviii., f. 192; *Autochiton virgatus exaggeratus*, of Iredale and Hull, Austr. Zool., iii., 1924, 284.)

A nice series of this little chiton was taken at Nornalup; these I have compared with examples I had collected at the type locality, Port Lincoln, in South Australia. They are certainly conspecific; I cannot find the slightest grounds for separation. Iredale and Hull propose the subspecific name, *exaggeratus*, for the western form, on the grounds of "greater size, darker colouration, and marked sculpture"; the examples that I have personally collected at Ellenbrook, near Yallingup, as well as Nornalup, are all normal in size and sculpture. In the sheltered waters of Venus Bay, in the Great Bight, I found that this species attains a much greater size than it does on the open coast, and also the colouration is darker. The sculpture of these large specimens is naturally a little coarser than is the case in the smaller ones; this must have misled Iredale and Hull into suggesting subspecific separation. The definitions supplied by the same gentlemen in support of their proposed new genus *Autochiton* are, in my opinion, below generic valuation.

ISCHNOCHITON VERCONIS, Torr, 1911.

Pl. xii., fig. 14.

(I. verconis, Torr, Trans. Roy. Soc. S. Austr., xxxv., 1911, 102; *Strigichiton verconis,* of Hull, Austr. Zool., iii., 1923, 195.)

Our knowledge of this species has hitherto been confined to the record of four examples: the first, the type, was taken by Torr at Ellenbrook, South-Western Australia, in 1910; the second was recorded by myself (Journ. and Proc. Roy. Soc. S. Austr., 1921-2, p. 33) as having been taken 600 miles further north, at Bernier Island, in Shark Bay, the example being in the Western Australian Museum; the third record is that of Hull, who found two specimens on one stone at Hopetoun, 100 miles eastward of Esperance, recorded *(l.c.,* 1923). Hull proposed a new generic name of *Strigichiton* for this species, on the strength of its having "girdle scales semi-erect, deeply grooved, of different sizes"; these characters alone are certainly beneath generic valuation, there are at least three species of Australian *Ischnochiton* which possess semi-erect girdle scales.

An Inculine Chiton.—I have now to tell the story of a discovery that will probably change this chiton from being one of the rarest of Australian chitons into one that will ultimately be represented in most collections. Mr. H. Rossell, whose interest in chitons had not up till the time of our meeting got beyond a decorative one, treating his specimens with acids, told me that some chitons were to be found under sea-urchins, and so we arranged to visit his collecting ground in the Quarantine Station, Fremantle, on the only afternoon available to us both, namely, the 5th November, 1927. A stiff off-sea breeze commenced as we entered the water, tide was fairly right, and we at once got down to the right zone and commenced turning over the larger rocks. In a few minutes a rock we had turned over had a couple of echinoderms clinging to the under side and, on removing the echinoderm, underneath was one of these rare chitons. The rock is a limestone, and all the larger sea-urchins had worn or excavated little circular hollows. Or these hollows may have been worn by an inculine shrimp or prawn which belongs to the Synalpheidae; in colour a dark reddish-brown with a mauve-coloured patch on the cervical region of the cephalothorax. Under most of the larger sea-urchins were from one to three of these shrimps, and also, in 10 cases, one of these strange Ischnochitons, the smaller ones under small sea-urchins and very large ones under very large echinoderms.

Ten specimens were taken before the fast rising waves, due to the stiff sea-breeze, drove us out of the water. One of the larger measured 35 mm. x 21 mm., girdle on each side 3·5 mm., foot 27 mm., gills numbered 40, and practically extended for the full length of the foot, or 23 mm. Head, longitudinally, 5 mm., and laterally, 10 mm.; the largest dry example, slightly curled, is 49 mm. in length, and the next 44·5 mm. x 29 mm., down to quite small ones.

The exceptional flatness or lack of elevation of this shell is evidently an accommodation to its peculiar environment, but I can hardly think that mere protection from danger and injury can be the only advantage derived from this association; the tube-feet are attached to the chiton by their suckers. Do these release when the chiton desires to move? Does the chiton obtain any nutriment from the excreta of the echinoderm? Or does it during the night go abroad foraging for food and return to the same sea-urchin or seek for another? Does the host obtain any advantage from the presence of the chiton? Or of the crustacean? All these are problems that can only be answered by future research and study.

ISCHNOCHITON (HAPLOPLAX) SMARAGDINUS WESTERNENSIS, Ashby, 1923.

(Ischnochiton (Haploplax) resplendens, var. *westernensis,* Ashby, Trans. Roy. Soc. S. Austr., vol. xlvii., 1923, 224-226.)

I find it difficult to determine the best method of expressing in classification what I conceive to be the true relationships of the forms of *I. smaragdinus,*

occurring in New South Wales, Tasmania, Victoria, South Australia, Western Australia. I cannot follow Iredale in giving generic status to the subgenus *Haploplax,* and herein slightly modify my earlier treatment.

Six examples were obtained at Nornalup. These are identical with those I collected at Yallingup, in 1920, and named var. *westernensis (l.c.).* In that paper an exhaustive review was given of the various sections of the subgenus *Haploplax,* and showed that *I. smaragdinus* s.s. was common to New South Wales and Tasmania; that a number of the same colour patterns occurred also in South Australia, but that in Western Australia the colour was always dark and the pattern consistent; that the name *I. resplendens,* Bed. and Mat., had been given on the basis of colour pattern only, which, of course, could not be accepted as a specific definition.

It was then shown that the shells from South Australia, irrespective of pattern, could be separated by the presence of slight radial ribbing in the end valves and lateral areas, and also in the very slight increase in strength of the minute decussated sculpture of the shell surface, this differentiation obviously being below specific valuation; *I. resplendens* was considered a subspecies of *I. smaragdinus.*

It was also pointed out that shells from Western Australia differ more widely from *I. smaragdinus* than does the South Australian form, in that the radial and decussate sculpture was stronger than it was in any of the examples from the other States, and also that the girdle scales were larger and broader. At that time I had only seen examples from Yallingup, but now that more material is available it seems best to recognise *westerensis* as a subspecies, as it better deserves that rank than any of the others above referred to. I still adhere to my stated opinion that *I. resplendens* does not deserve to rank higher than a subspecies of *I. smaragdinus,* and cannot follow Iredale and Hull in recognising it as a good species.

"Short Key."—Iredale and Hull, in their Short Key to genus *Haploplax (l.c.)* say, in reference to *I. resplendens,* "colouration distinctive." My examples of South Australian shells show equal variation in colour and pattern to the New South Wales and Tasmanian shells, but as shown in my paper *(l.c.)* there is one striking pattern common to those two States that does not occur in the other States, and there is another specialized pattern that occurs in Victoria, South Australia, and Western Australia. The only State in which colour and pattern are consistent is that of Western Australia. In the same "Key" they state, in reference to *I. thomasi,* "colouration consistent." This is not so, for I have in my collection an example in which the shell is black and girdle buff; and others, in which black, white, and green produce much variety in colour and pattern.

Ischnochiton (Haploplax) thomasi, Bednall, 1897.

(I. thomasi, Bednall, Proc. Mal. Soc. Lond., vii., 1897, 149.)

One example, 10 mm. in length, was taken at Nornalup. Mr. Glauert has sent to me for identification a very fine specimen measuring 15 mm. x 7 mm. (Mus. No. 10992) taken at Cottesloe.

Ischnochiton (Heterozona) cariosus, Dall, 1878.

(Heterozona cariosus, Dall, Proc. U.S. Nat. Mus., 1878, 331; *Ischnochiton cariosus,* Pilsbry, Man. Conch., xiv., 1892, 65.)

Three dozen were taken at Nornalup and one and a half dozen at Quarantine Station. From both localities the sculpture is sharper and more nodulose than is the case with shells from South Australia, but those from the Quarantine Station show the greater divergence. This material seems to justify the retention of the name var. *occidentalis,* Ashby, for the western form; but, at present, we

are not in the position to decide whether there is a gradual increase in the strength of sculpture westerly from South Australia, or whether a distinct race has been evolved in the western State.

Subfamily CALLISTOPLACINAE, Pilsbry, 1892.

Genus *Callistochiton*, Carpenter, 1882.

CALLISTOCHITON MERIDIONALIS, Ashby, 1919.

Three specimens were obtained at Nornalup and three at the Quarantine Station; these all were quite typical shells.

Family CHITONIDAE, Pilsbry, 1892.

Subfamily CHITONINAE, Pilsbry, 1892.

Genus *Chiton*, Linné. 1758.

Subgenus *Rhyssoplax,* Thiele, 1893.

CHITON (RHYSSOPLAX) TORRIANUS, Hedley and Hull, 1910.

This chiton was numerous at Nornalup; 26 examples, many quite small, were secured. The range of habitat extends from Gulf St. Vincent, in South Australia, greatly increasing in numerical strength and in size in Spencer's Gulf, Albany, Nornalup, and at Yallingup near Cape Naturalist, facing the Indian Ocean. I found it fairly numerous in 1920. Throughout this range there is no appreciable change in character of sculpture, although I described a striking variety from Corney Point under the name var. *klemi.*

Subfamily LIOLOPHURINAE, Pilsbry, 1893.

(=ACANTHOPLEURINAE, Thiele, 1910.)

Genus *Liolophura*, Pilsbry, 1893.

LIOLOPHURA HIRTOSUS (Peron, M.S.), Blainville, 1825.

(*Chiton hirtosus*, (Peron, M.S.) Blainville, Dict. Sci. Nat., (Levrault) xxxvi., 1825, 546; *Clavarizona hirtosa*, of Hull and Iredale and Hull; *Liolophura georgiana*, Q. and G., of Ashby, Trans. Roy. Soc. W. Austr., viii., 1921-2, 32.)

Memo.—The proposed genus *Clavarizona* was founded on the modification of the girdle clothing which in *L. gaimardi* consists of thick, blunt, calcareous spicules, intermingled with numerous, short, thick, calcareous knobs, while in *L. hirtosa* the longer calcareous processes are absent, and the shorter ones have been still further modified into irregular, thick, calcareous semi-scales, and the girdle clothing of *Liolophura japonica* is almost similar. Except for the slight modification of these calcareous processes, *L. hirtosus* is both externally and internally a typical *Liolophura*, the peculiar modification of the insertion plate of the tail valve into a thickened terminal plate, termed by Pilsbry a "flat callous ledge," so characteristic of the members of this genus, is typically present in this species; certainly no adequate grounds have been advanced for the introduction of this new generic name. This species was by far the most common chiton at Nornalup, and it is also very numerous in the neighbourhood of Fremantle.

Genus *Onithochiton*, Gray, 1847.

ONITHOCHITON SCHOLVIENI, Thiele, 1910.

(*Onithochiton scholvieni*, Thiele, 1910, Rev. Syst. der Chitonen, pt. ii., 1910.)

Three examples were obtained at the Quarantine Station. This shell extends northwards to a spot between Carnarvon and Maud's Landing. At this latter locality it is very numerous on rocks facing the open sea, a position that is preferred by this species. I am not aware of any records of the occurrence of this *Onithochiton* along the northern coasts of Australia, but on the eastern coasts

of Queensland and New South Wales another species takes its place, *O. quercinus*, Gould. The distinguishing characters, which separate these two species, still require working out; the immense gap between their respective habitats certainly supports Thiele's contention that they represent two distinct species, but when Thiele proposed his name his material was quite inadequate for complete comparison between the two forms.

EXPLANATION OF PLATE XII.

Fig. 1. *Chiton (Rhyssoplax) excellens capricornensis*, Ashby. Capricorn Group, Queensland. Holotype, whole shell (curled), showing netted sculpture and nodulose lateral ribbing. Ashby Coll. × 5.

Fig. 2. *Callistochiton generos*, Iredale and Hull. Capricorn Group, Queensland. Topotype, whole shell showing netted sculpture and nodulose lateral ribbing. Ashby Coll. × 5.

Fig. 3. *Chiton (Rhyssoplax) translucens*, Hedley and Hull, Port Stephens, New South Wales. Anterior valve. Ashby Coll. × 4.

Fig. 4. *Chiton (Rhyssoplax) translucens*, Hedley and Hull. Median valve, same example as fig. 3, shows tegmentum bowed strongly forward, for comparison with No. 11. Ashby Coll. × 4.

Fig. 5. *Chiton (Rhyssoplax) translucens*, Hedley and Hull. Tail valve, same example as fig. 3. Ashby Coll. × 4.

Fig. 6. *Acanthopleura gemmata*, Blainville. Dunk Island, Queensland. Holotype of var. *queenslandica*, now neotype of *A. gemmata*, Bl. Anterior valve, showing short teeth of insertion plate for comparison with fig. 8. Ashby Coll. × 4.

Fig. 7. *Acanthopleura gemmata*, Blainville. Tail valve, same example as fig. 6, showing short teeth of insertion plate for comparison with fig. 9. Ashby Coll. × 4.

Fig. 8. *Acanthopleura gemmata maudensis*, Ashby. Maud's Landing, Western Australia. Holotype, anterior valve showing the long teeth in the insertion plate, compare with fig. 6. Ashby Coll. × 4.

Fig. 9. *Acanthopleura gemmata maudensis*, Ashby. Tail valve, same example as fig. 8, showing long teeth of insertion plate, compare with fig. 7. Ashby Coll. × 4.

Fig. 10. *Chiton (Rhyssoplax) kimberi*, Ashby. Capricorn Group, Queensland. Holotype, anterior valve. Ashby Coll. × 4.

Fig. 11. *Chiton (Rhyssoplax) kimberi*, Ashby. Median valve, same example as fig. 10, showing straight anterior edge of tegmentum, compare with fig. 4. Ashby Coll. × 4.

Fig. 12. *Chiton (Rhyssoplax) kimberi*, Ashby. Tail valve, same example as fig. 10. Ashby Coll. × 4.

Fig. 13. *Chiton (Rhyssoplax) excellens*, Ashby. Darnley Island, Torres Strait. Holotype, half median valve, Iredale and Hull's, fig. 40, pl. xiii., compare with fig. 1; this shows no netted sculpture, photo. of Iredale and Hull's drawing of *excellens*, equal size.

Fig. 14. *Ischnochiton verconis*, Torr. Fremantle, Western Australia. Whole shell showing erect scales and fine sculpture. Taken from under a sea-urchin. Ashby Coll. × 4.

NOTES AND DESCRIPTIONS OF NEW SPECIES OF THE GENUS PSEUDOTETRALOBUS.

FAMILY ELATERIDAE; SUBFAMILY TETRALOBIDES.

By Albert H. Elston, F.E.S.

[Read August 9, 1928.]

The subfamily Tetralobides originally contained only one genus, *Tetralobus,* the geographical distribution of which was spread over Africa, Madagascar, Australia and New Guinea; the greatest number of species coming from the first-mentioned country. The species, however, from the Ethiopian Region vary in structural characters from those of the Australian Region, the chief difference being that the species from Africa have the head in the forepart margined, whereas the Australian species, comparatively, have not an elevated margin on the anterior part of the head. Another very important difference between the African and the Australian species is that the former all have eleven-jointed antennae, and the latter with distinctly twelve joints, with the exception of some female specimens of *Pseudotetralobus australasiae,* Gory, which have only eleven joints. It was chiefly upon these two structural differences that Schwarz[1] separated these two groups and proposed the new generic name *Pseudotetralobus* for those species belonging to the Australian Region.

Blackburn,[2] in his Note on the above genus, considered the following five species as one: *P. australasiae,* Gory; *P. manglesi,* Hope; *P. fortnumi,* Hope; *P. cylindriformis,* Cand.; and *P. murrayi,* Cand., whereas this paper treats them as three separate species; *manglesi* and *cylindriformis* being synonymous to *australasiae* and *fortnumi,* respectively. The reasons for this distinction are given separately under the headings of each species.

Pseudotetralobus albertisi, Cand.

This species, which is the most easily distinguished one in the genus, was named from a female specimen; the male was unknown to Candeze, whereas the present author has only seen males, and these agree very well with the description given of the female, except that the antennae are elongately lamellate from the fourth joint. The pronotum of this species is its main distinguishing feature; it is almost quadratic in shape, being very slightly narrower posteriorly than in the forepart; with large, deep rugose punctures; the longitudinal median line is lightly impressed along the whole length; the surface is uneven, but usually having four distinct depressions, one on each side of the median line near the middle, midway between the latter and the lateral margins, the other two near the posterior fourth, one on each side of the median line, but situated nearer to the lateral margins; the posterior angles have no inside carina. The elytra are distinctly striated, the striae with scattered, almost obsolete punctures; the interstices moderately wide and lightly convex, with densely arranged, small, round punctures; the apices distinctly mucronate. Length, 29-31 mm.; width, 7-8 mm.

(1) Stett. Ent. Zeit., 1902, p. 210.

(2) Proc. Linn. Soc. N.S. Wales, 1888, p. 1416.

PSEUDOTETRALOBUS AUSTRALASIAE, Gory.

The above species is distinguished from *P. fortnumi*, Hope, by its much wider form; the pronotum more quadratic in shape and its posterior angles less acute, not so conspicuously produced backwards and less divergent. It more closely resembles *P. murrayi*, Cand., but may be easily separated from that species by its slightly less elongated form and the shape of its pronotum and the posterior angles of same; in *murrayi*, the sides of the pronotum are strongly contracted in front of the posterior angles which are strongly produced backwards (more so than in *fortnumi*), acute and strongly divergent, whereas in *australasiae* the lateral margins of the pronotum are lightly sinuate in front of its posterior angles which are only slightly produced backwards. The female of this species shows a great variability in the last two joints of the antennae. On some specimens these two joints are quite separate, the twelfth joint articulating on the eleventh (fig. 1); on other specimens these two joints have cohered together, one not articulating on the other, but nevertheless showing a distinct suture marking the cohesion of these joints (figs.

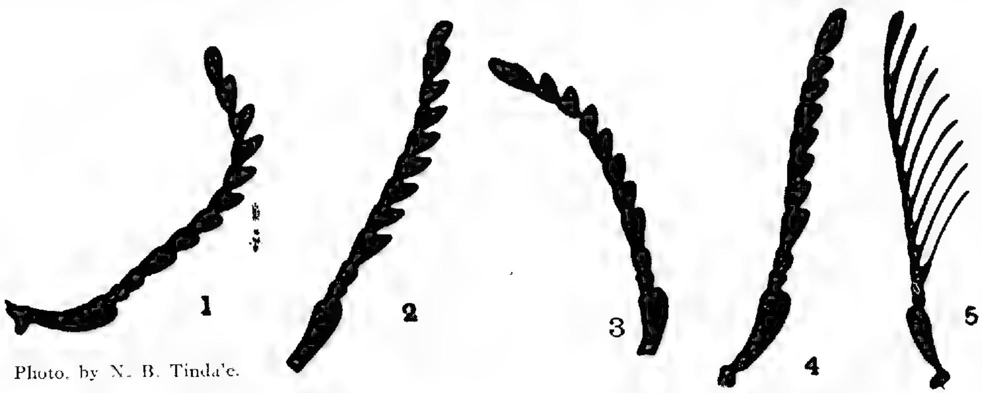

Photo. by N. B. Tindale.

Antennae of *Pseudotetralobus australasiae*, Gory. Figs. 1-4, female; fig. 5, male.

2 and 3); on another specimen (fig. 4) the cohesion of the joints is perfect, there being only a slight emargination to show where agglutination has taken place; the antennae of the male appears to be consistently twelve-jointed (fig. 5).

PSEUDOTETRALOBUS FORTNUMI, Hope.

This species can be easily distinguished from *australasiae* and *murrayi* by its more elongate appearance, particularly with the female. The elytra of the males have more or less strongly impressed striae which are impunctate, except near the apex, where there are a few large, round punctures; the interstices are lightly convex and closely covered with rather large, moderately deep, subrugose punctures. The females have their elytral striae more or less uniformly punctured.

PSEUDOTETRALOBUS MURRAYI, Cand.

The above species was named from a female only; the male differs from the female in being slightly more narrow in proportion, the antennae elongately lamellate from the fourth joint, nonfoveate on the vertex of the head, the longitudinal median furrow of the pronotum faintly impressed with a more conspicuous fovea in the middle, the posterior angles of the pronotum slightly larger and more divergent. This species can at once be separated from *P. australasiae*, Gory, by the more uneven surface of the pronotum, the posterior

angles of the latter being much more elongated, strongly divergent and produced backwards, and with the elytral striae less deeply impressed. The males of *murrayi* and *fortnumi* closely resemble each other, but may be distinguished by the former being more robust, proportionately wider, and the punctures on the elytra more distinct, whereas on the latter the punctures are not individually distinct but have a transverse rugose appearance; the females of these two species are very distinct and could not be easily confused. *fortnumi* is a more elongate insect, more convex, both above and below, which gives it a cylindrical or tubular appearance, and with the prothorax longitudinally impressed in the middle.

Pseudotetralobus corrosus, Cand.

This is a very distinct species. I have seen a large number of males but only one female; the elytral sculpture of the former varies somewhat, the punctures in the striae are much more deeply impressed on some than on others, also the interstices of the striae vary in their convexity. The female specimen before me differs from the males by being somewhat darker in colour, larger and more robust, and with the antennae pectinate instead of being elongately lamellate.

Pseudotetralobus quadrifoveatus, Macl.

The specimen before me, through the courtesy of Mr. H. J. Carter, has been compared with the type. The pronotum, however, is as wide as long (actual measurements), although it appears to be longer than wide. It seems to me that Macleay, in some of his descriptions, did not actually measure his specimens but trusted to his eye, because I have noticed this discrepancy on two or three previous occasions.

The above species, in general appearance, closely resembles *P. corrosus*, Cand., but may be distinguished from that species by the posterior angles of the pronotum not being so strongly produced backwards, the longitudinal depression on the head shorter, the interstices of the elytral striae more convex and less densely punctured, and the sutural angles of the elytra more acutely mucronate.

Pseudotetralobus pumilis, Cand.

The author in his description of this species distinguished it from *P. corrosus*, Cand., not only by its much smaller size but chiefly on account of it having only two impressions on the pronotum instead of four. I have before me two specimens from North Queensland which are, without doubt, conspecific with the insect described as *pumilis*, but both of these have four impressions on the pronotum similar to those on *corrosus;* however, notwithstanding this similarity, I still think it desirable that these two names should stand, although the former may prove to be only a variety of the latter. I am not considering the separation of these two species on the disparity of size only, there is also a distinct difference in the punctures on the pronotum. *P. pumilis* has the pronotum more densely punctured than *P. corrosus*, the punctures not only being more contiguous to each other but also having a much more rugose appearance; the longitudinal median impression on the former is almost obsolete, whereas on the latter it is more or less deeply impressed.

Pseudotetralobus castaneus, n. sp.

♂. Elongate; subnitid, castaneous, with the head, pronotum and prosternum slightly darker than the rest of the body; moderately densely clothed with very short, depressed golden hairs, except on the posterior part

of pronotum, scutellum and metasternum, where they are much longer and more tomentose. Head elongate, in forepart narrowed and with a large, deep depression, longitudinally furrowed in the middle; closely and irregularly punctured, the punctures more densely arranged in the forepart than on vertex. Pronotum (across posterior angles) wider than long, convex, the longitudinal median furrow lightly impressed except in the middle where there is a more or less deep depression, the lateral margins convexly curved on the anterior half and widely sinuate on the posterior half, with two large, deep depressions just in front of the middle and situated one on each side of the median line and midway between the latter and the sides and with two shallow depressions (similarly situated) behind the middle, the posterior angles are large and acute, slightly divergent and produced backwards well behind the shoulders and with a well-defined carina extending upwards to the middle of the sinuosity; with moderately large, deep, irregular punctures, those on the posterior half much smaller and more densely arranged than those on the anterior half. Scutellum elongately cordate, lightly concave, and with densely arranged, moderately large and deep punctures. Elytra at base narrower than width of pronotum and about three and a half times as long as the latter, lightly convex, minutely mucronate at the sutural angles, barely punctate-striate, the interstices almost flat and with densely arranged, minute punctures. Length, 30-37 mm.; width, 9-11 mm.

Queensland: Cunnamulla (H. Hardcastle). Northern Territory. Type, in South Australian Museum.

A species that could not be easily confused with any other in the genus: it is very conspicuous by its colour and the obsolete striae of the elytra are each marked with a row of small, black, irregular spots, which are more distinct on some specimens than on others; the antennae are elongately lamellate.

Pseudotetralobus apicipennis, n. sp.

♂. Elongate; subnitid; dark castaneous, with the antennae and elytra of a slightly lighter shade; rather densely clothed with short, depressed, griseous-yellow hairs—except near base of pronotum, metasternum and sides of abdomen, where they are longer and more or less tomentose. Head longer than wide and narrower in forepart than behind, with a moderately deep, elongate depression extending from the anterior margin up to the posterior third; with rather large, deep, round punctures more crowded in forepart than behind; the antennae are elongately lamellate from the fourth joint, the second and third joints are very small. Pronotum about as long as the width (across posterior angles), evenly convex, the longitudinal median line only impressed near the middle, with two shallow transverse depressions just in front of the middle and situated one on each side of the median line and about midway between the latter and the sides; the lateral margins lightly rounded near the middle, only very slightly roundly contracted near the anterior angles and widely sinuate in front of the posterior angles which are moderately large, acute, divergent and produced backwards, with a well-defined carina extending (inside the lateral margin) up to about the middle of the pronotum; with closely placed, large, deep, almost reticulate punctures, near the lateral margins more crowded and confused and posteriorly much denser and smaller. Scutellum elongate, concave, attenuated posteriorly, with moderately large, round punctures. Elytra across shoulders slightly narrower than pronotum across posterior angles and about three and one-third times as long, sides almost straight and parallel to near the middle then gradually roundly contracted to apex, which is strongly mucronate; punctate-striate, the striae

comparatively deep and with closely placed, moderately large and deep punctures, the interstices are wide and lightly convex, with densely arranged, minute, transversely rugose punctures. Length, 25-28 mm.; width, 7-9 mm.

Western Australia: Eucla. Type, in South Australian Museum.

This insect is quite distinct from any other previously described species of the genus. The apices of the elytra differ from the other species known to me; instead of being rounded or emarginate, either with or without a mucronate process at the sutural angles, as is the case with other species; the elytra, from near the middle, are gradually attenuated and terminate with a large mucronate process, and with the sides in front of the latter feebly sinuate. I have seen no females of this species.

Pseudotetralobus sulcicollis, n. sp.

♂. Elongate; subnitid; dark brown with the head and prothorax fuscous, antennae testaceous (except basal joint which is ferruginous), legs ferruginous, rather densely clothed with short, depressed, subseriate, golden hairs, longer near base of pronotum and on metasternum but not tomentose. Head elongate and not much narrower in forepart than behind; with a large, deep, triangular depression, the apex of which reaches up to just beyond the middle; with large, deep, closely placed, irregular punctures, in forepart more densely arranged and subrugose. Pronotum about as long as wide, surface very uneven and lightly convex, inside lateral margins widely flattened, with a well-defined, deep, longitudinal median furrow extending almost the whole length; with two moderately large, deep depressions just in front of the middle and situated one on each side of the median line and about midway between the latter and the lateral margins, also with two larger, but more shallow, subbasal depressions similarly situated, and with two deep, transverse basal depressions, one on side of the basal tubercle; the lateral margins evenly rounded, the widest part being just behind the anterior angles, widely, but not deeply, sinuate in front of the posterior angles which are acute, moderately divergent and produced backwards and with an indistinct carina; with large, deep, closely-placed punctures. Scutellum elongate, narrowed posteriorly and rounded at apex, concave, densely covered with moderately large, deep, subreticulate punctures. Elytra across shoulders barely wider than pronotum across posterior angles and about thrice as long, sides almost straight and parallel to near apex and more or less abruptly roundly contracted, apex briefly mucronate at sutural angle; rather deeply punctate-striate, the striae with large, shallow punctures, the interstices costate and closely covered with small, round, deep punctures. Length, 25-30 mm.; width, 8-9 mm.

Queensland: Stewart River (H. M. Hale, N. B. Tindale). Moa Island (G. A. Luscombe). Type, in South Australian Museum.

This is a very distinct species and could not be easily associated with any other of the genus known to me. It might possibly be allied to the insect Candeze described as *capucinus*, but as the description of the latter species is very vague and brief, it would be impossible to compare them without first referring to Candeze's type. I have seen no females of this species.

Pseudotetralobus punctipennis, n. sp.

♂. Elongate; subnitid; dark reddish-brown, antennae fulvous (except first three basal joints which are reddish), legs ferruginous; rather densely clothed with short, subseriate, golden hairs, on metasternum and abdomen they are longer (but not tomentose) and more or less sericeous. Head not

longer than wide, narrower in forepart than behind, with a large, moderately deep, triangular depression extending from the base up to beyond the middle; with rather large, deep, subreticulate punctures, smaller and more or less rugose in forepart. Pronotum as long as wide, lightly convex, depressed inside lateral margins, the longitudinal median furrow only clearly defined near the middle; with two large, deep, transverse depressions in front of the middle, situated one on each side of the median line and midway between the latter and the lateral margins, and between each of these depressions and the sides of pronotum is a moderately large and deep longitudinal depression, the surface of the posterior fourth is more or less uneven; the lateral margins roundly dilated in front of the middle, abruptly, almost angularly, sinuate in front of the posterior angles which are acute, divergent and produced backwards, bicarinate, the outside carina very strongly marked and extends upwards almost to the anterior margin, the inside carina less clearly defined, shorter and extends along the basal margin; with closely arranged, moderately large and deep punctures, behind the middle subreticulate. Scutellum elongate, concave, attenuated behind and densely punctured. Elytra across the shoulders about the width of pronotum and a little less than thrice the length of the latter, deeply impressed inside the humeral angles, sides almost straight and parallel to beyond the middle than gradually, roundly contracted to apex which is emarginate and briefly mucronate at the sutural angles; deeply punctate-striate, the interstices closely and minutely punctured, costate on the basal half and transversely rugose. Length, 26-31 mm.; width, 8-10·5 mm.

North-West Australia: Derby (W. D. Dodd). Type, in South Australian Museum.

This species should be easily distinguished from its congeners by the shape of its pronotum, the deep striae on the elytra and the interstices of same strongly costate on the basal half. I have seen no females of this species. In general appearance it somewhat resembles *P. sulcicollis*, Elston, but has the punctures on the pronotum much finer and the carina very strongly marked.

Pseudotetralobus conspectus, n. sp.

♀. Elongate; head and pronotum nitid, remainder subnitid; reddish-castaneous, abdomen paler, joints four to twelve of antennae testaceous, the three basal ones and legs reddish; both upper and under surface without clothing, except the posterior margin of pronotum and base of elytra, where there are a few scattered golden hairs and the anterior margin of pronotum has a conspicuous fringe of short hairs of the same colour. Head elongate, narrower in forepart than behind, anterior margin lightly bisinuate, with a large, deep, triangular depression, the apex of which extends upwards to beyond the middle; with irregularly (but not closely) placed, moderately large, round, deep punctures. Pronotum as wide as long, convex, narrowly depressed inside lateral margins, the longitudinal median furrow deeply impressed from the anterior margin to near the base where it terminates in front of an elongate, conspicuous tubercle; with six clearly-defined depressions, three on each side of the median line and situated about midway between the latter and the sides, two are near the anterior fourth, the intermediate ones are just in front of the middle, and the remaining two are near the posterior fourth, there is also a shallow, elongate depression inside each of the lateral margins; the latter evenly rounded, and they are at their widest distance apart near the anterior third, widely and lightly sinuate in front of the posterior angles which are very small, very slightly divergent and barely perceptibly produced backwards, the inside carina is very feeble, almost obsolete; with scattered,

moderately large and deep, stipple-like punctures, much smaller and more crowded on the posterior fifth. Scutellum cordate, strongly concave; with densely arranged, small round punctures. Elytra across shoulders slightly wider than pronotum across posterior angles and a little more than thrice the length of the latter, lightly impressed inside the humeral angles, sides almost straight and parallel to beyond the middle and then gradually, roundly contracted to apex which is almost imperceptibly emarginate and very briefly mucronate at the sutural angles; lightly striate, the punctures in the striae only just perceptible near the base and the lateral margins, elsewhere obsolete, the interstices are wide and flat, densely covered with minute, stipple-like punctures. Length, 36 mm; width, 10·5 mm.

North-West Australia: From the collection of J. S. Clark. Type, in author's collection.

Although there is only a female specimen before me, I have not hesitated to describe it as a new species because it is so unlike any other hitherto known member of the genus. The entire absence of clothing on both the upper and under surface is very unusual, and at once distinguishes this species from all its congeners; this lack of clothing is not, in my opinion, due to abrasion. The nitid pronotum is also characteristic, and it appears to the eye to be longer than wide, although by measurement the width at its widest part is quite equal to the length.

A RECENT RAISED BEACH NEAR PORT TURTON, YORKE PENINSULA.

By Edward Vincent Clark, B.Sc., M.Inst.C.E., M.I.E.Aust.
(Communicated by Professor Walter Howchin.)

[Read August 9, 1928.]

Port Turton, situated in Spencer's Gulf, on the northern shore of the foot of Yorke Peninsula, is sheltered from the western seas by a headland of Miocene polyzoal limestone, formerly quarried for flux by the Broken Hill Proprietary Company. Eastwards, extends for many miles a long sweep of sandy beach, forming Hardwicke Bay. West of the headland, the ground falls rapidly; and the shoreline onwards to Corney Point (where igneous rocks occur) consists of alternations of sandy beach and Miocene rock.

The road from Warooka to Port Turton terminates at the jetty; but a rough track, leading on between the quarry and the shore, crosses the promontory and skirts the coast for some miles. About half a mile beyond the jetty the first sand beach is reached; and following this for some two hundred yards, one encounters a well-defined raised beach of indurated sand, richly studded with shells.

Where first met with, and onwards for a quarter of a mile or so, this raised beach forms the principal feature of the low, sloping cliffs, extending from their base upward for five or six feet. Above this bed the cliff is of a nondescript nature, much softer, and considerably littered with fragments of the travertine-like crust which crowns it, the height of the cliff decreasing from about fifteen feet where the raised beach is first seen, to ten feet where the Miocene rock is again met with.

The raised beach is horizontally bedded, and though soft enough to allow shells to be readily scraped out with a pocket knife, is nevertheless sufficiently indurated to stand out boldly at the foot of the cliff. It exhibits differential weathering to an appreciable extent, and in some places is undercut to a depth of three feet or so.

Shells are seen in extreme profusion in places, but their number varies markedly, both horizontally and vertically. In particular, a band about six inches thick near the lower visible limit is comparatively free from shells, and can be followed for some distance. The great majority of shells are of a cockle-like nature, much bleached, and almost wholly in single valves. At only one spot were double valves found. Occasional specimens of other shells were met with, the writer collecting ten species, all apparently identical with forms that might be found on the beach below. Sir Joseph Verco, who has kindly examined the shells, confirms this opinion, and has supplied the appended list of names, having identified, also, six different species among the twenty or so of cockle-like shells collected at random.

A few pebbles are included in the bed, but they are not numerous, although the present beach is here somewhat shingly.

Proceeding westwards, the cliff becomes lower; and, presently, Miocene rock appears on the beach, first as detached fragments, and then in mass formation, but not extending more than a few feet above high water level. The raised beach deposits, overlying the Miocene, can still be detected, and were traced along the cliff for some two miles, but are now much less prominent;

for although, if anything, more indurated than where first met with, they now form the softest part of the cliffs, which are here more vertical, and hence escape notice unless sought for. The overhanging travertine crust, in places, has shells adhering to it, having evidently been formed directly upon the raised beach. In places, too, these beds were evidently deposited directly upon the Miocene rock, and have become cemented thereto, so that detached blocks of this may be found with recent shells encrusting one face. This formation may be seen *in situ* a little eastwards of the point where the raised beach was first observed. Here there is a floor of Miocene rock, some four or five feet above high water mark; and, in places, this is capped by a film of tightly adhering sand with a few shells showing, the contrast between the yellow-brown of the limestone and the slaty-grey of the old-beach sand being very marked.

At the point where the cliff is lowest, it has been cut through by an artificial channel, draining some low lying parts of the old Orrie Cowie station. The section of the cliff made by this cutting shows some two feet of travertine immediately overlying a three-inch layer rich with shells. Then comes about three feet of sand in which shells are scarce, and below this comes two or three feet in which shells are plentiful. One can trace the uppermost shelly layer some fifty yards up the channel, but owing to vegetation and debris in its bed, some three or four feet above high water mark, the lower shelly layers are only visible for a few yards.

Summarising, it may be said that this raised beach is traceable in the cliffs of the shoreline for at least two miles. Its upper limit appears to be about five or six feet above high water mark, its base resting on the Miocene limestone in some places, elsewhere disappearing below the sand of the present beach. It is reported that in various low-lying parts of southern Yorke Peninsula the spoil from excavations for post holes, etc., often contains recent shells, so the extent of raised beach formation is probably considerable. The locality cited presents a definite section.

The following list gives the shells collected, kindly identified by Sir Joseph Verco:—

Pelecypoda.

Marcia scalarina
Marcia strigosa
Anapella triquata
Anapella cuneata
Mactra abbreviata
Mesodesma gabrella
Cardium tenuicostatum
Tellina biradiata
Arca fasciata
Chlamys bifrons
Ostrea viriscens

Gastropoda.

Bullaria botanica
Cellana variegata
Turbo undulatus
Nerita melanotraga
Bembicium melanostomum

NOTES ON NEWLY-DISCOVERED FOSSILS IN THE ADELAIDE SERIES, (LIPALIAN ?) SOUTH AUSTRALIA.

By Professor Sir T. W. Edgeworth David, K.B.E., C.M.G., D.S.O., F.R.S., etc.

[Read May 10, 1928.]

Plates XIII. to XVIII.

I. Introduction.

For some thirty years past the author, in collaboration with Professor Walter Howchin, who has played so large a part in solving so many of the geological problems of this State, and thrilled the world with his brilliant researches on the glacial tillites in the Adelaide Series, has from time to time studied, in the field and in the laboratory, rocks of the Adelaide Series likely to contain any possible organic remains. The newly-discovered fauna appears to be wholly pre-trilobite and, with the exception of the Eurypterids, appears to differ greatly from the Cambrian, being probably mostly chitinous, when not soft-bodied.

The specimens available for this study, which were partly collected by himself, have been chiefly got together and generously placed at his disposal by his collaborator.

II. Previous History and Bibliography of Pre-Cambrian Fossils.

(a) In Australian Areas.

As regards the fossil fauna, in 1898 Professor W. Howchin and the author[1] figured certain problematical types of Radiolaria from the greenish glauconite (?) sandstones of Brighton, South Australia, and from the silicified limestones of Crystal Brook. The author has also published a note on the remains of small crustacea in the rocks of Reynella, near Adelaide.[2] The latter were extremely fragmental.

Within the last few days, in re-examining a large number of micro-slides, prepared by Mr. H. G. Gooch at the Geology Department of the University of Sydney, the author has suddenly realized that in the siliceous limestones of Reynella remains are preserved of arthropods and annelids of quite extraordinary interest, in spite of the fact that the fossils hitherto found are mostly fragmental.

As regards the flora hitherto recorded, Professor W. Howchin[3] has described and figured *Cryptozoön australicum*, discovered by Dr. Charles Chewings, at Acacia Well, on the road from Alice Springs to Arltunga, in the Macdonnell Ranges. Although these are provisionally assigned by him to Cambrian time, subsequent discoveries by Sir Douglas Mawson[4] in the north-eastern Flinders Ranges make it possible that these fossils from the Macdonnell Ranges may possibly belong to the Adelaide Series. Mawson discovered these forms, figured as

(1) David, T. W. E., and Howchin, W., Proc. Linn. Soc. N.S. Wales, 1886, pp. 571-583, pls. xxxix. and xl.

(2) David, T. W. E., Trans. Roy. Soc. S. Austr., vol. xlvi., 1922, pp. 6-8, pl. ii., figs. 1-3.

(3) Howchin, W., *Cryptozoön* in the (?) Cambrian of Australia, Trans. Roy. Soc. S. Austr., vol. xxxviii., 1914, pp. 1-10, pls. i. to v. Also, see by same author, The Geology of South Australia, 1918, pp. 376 377.

(4) Mawson, Sir D., Evidence and Indications of Algal Contributions in the Cambrian and Pre-Cambrian Limestones of South Australia, Trans. Roy. Soc. S. Austr., vol. xlix., 1925, pp. 187, 188, pl. xiii.

Cryptozoön, at Italowie. He also records *(op. cit.,* p. 188) a *Halimeda*-like organism from limestone blocks, west of Wooltana, at McLeach's Well. F. Chapman [5] has described this fossil as *Mawsonella wooltanensis.* He also mentions problematical fossil algae from Burra. All may belong to (?) Proterozoic horizons.

Dr. L. K. Ward discovered *Cryptozoa,* generally resembling those found by Chewings and Mawson, at Ooraminna Rockhole. He assigns an Ordovician age to the fossiliferous dolomitic limestone, whereas Chewings considered his fossil horizon Cambrian, but in the opinion of the author, an "Adelaide Series" age (Lipalian ?) is not entirely excluded, in regard to both the above cases.

Dr. Arthur Wade [6] records the occurrence of markings with tracks and trails apparently of organic origin in the Lower Cambrian or Proterozoic rocks (probably the latter.—T. W. E. D.) of (1) Mount John, in the Kimberley region of Western Australia; (2) in the Victoria River area of North Australia; (3) at Elcho Island and in the Cape Wilberforce district, on the north-west side of the Gulf of Carpentaria. Speaking of these Wade says *(op. cit.,* p. 30): "Our most interesting find consisted of a variety of fossil remains in these (Mount John,—T. W. E. D.) siliceous flags and shales. These consisted of the tracks of forms of life unknown to us—worm tracks, long stem-like structures sometimes in great profusion, and other more complex and more obscure forms." Wade found these markings of value for purposes of correlation.

Since the reading of the author's paper A. Mackintosh Reid has recorded in the daily Press the discovery by him of what appear to be the casts of tortuous burrows of annelids, showing as brown material, in a fine-grained friable white quartzite, at Cox's Bight and Port Davey, south-west Tasmania. Regarding annelids C. D. Walcott states [7]: "As a rule the annelids have been known only by trails and borings in the muds and sands deposited in the various periods between the Pre-Cambrian Algonkian and the present, and only under very exceptional conditions have any traces of the actual annelid been preserved. The most noted discoveries are those in the Upper Jurassic Solenhofen lithographic shales of Bavaria and the Eocene shales of Monte Bolca. Another discovery, that has long escaped the attention of authors, is that made by Dr. E. O. Ulrich, and described by him in 1879 (Journ. Cincinnati Soc. Nat. Hist., vol. i., 1879, pp. 87-91, pl. 4, figs. 1-4). These fossils appear to be true segmented Polychaetous annelids from the Ordovician shale at Cincinnati, Ohio." It is sad to reflect that this splendid worker in the fields of Cambrian and Pre-Cambrian Palaeontology passed from us on the eve of the discovery of this Lipalian life predicted and named by him, and now known to be so extensively developed in Australia.

An annelid showing probably the actual gill-plumes has been recorded by F. Chapman [8] from the Silurian rocks of Victoria).

The interest in this find of fossils is twofold, stratigraphical and palaeontological: stratigraphical, for this horizon ranges from about 2,000 to 12,000 feet below the lowest geological horizon hitherto proved to contain macroscopic fossils

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(5) Chapman, F., On a New Genus of Calcareous Alga, from the Lower Cambrian (?) west of Wooltana, S. Austr., Trans. Roy. Soc. S. Austr., vol. li., 1927, pp. 123-125, pl. vi.

(6) Wade, A., Petroleum Prospects, Kimberley District of Western Australia and Northern Territory. By Federal authority. Melb., 1923-4. Pages 30, 34, 36, and 37, pls. vii.-xii.

(7) Walcott, C. D., Cambrian Geology and Palaeontology, II., No. 5, Middle Cambrian Annelids, Smithsonian Miscellaneous Collection, vol. 57, No. 5, p. 110.

(8) Chapman, F., Palaeozoic Worms with Evidence of Soft Parts, Proc. Roy. Soc. Vic., vol. xxx. (N.S.), pt. ii., 1919, p. 317 *(Trachyderma,* c.f. *Crassituba,* with prostomial gills).

in Australia, namely, the horizon of the *Archaeocyathinae* limestones and the underlying pteropod calcareous shales with pteropods, described by C. T. Madigan,[9] at Myponga Jetty, to which a Lower Cambrian age may be assigned. Palaeontologically the structure of the newly-discovered organisms, with the exception, perhaps, of the eurypterids, seems unlike that of any forms hitherto recorded from any part of the world; but it must be remembered that the more complete forms figured in this paper are mostly minute types.

In view of the perfection with which many of the appendages of these small crustacea are preserved, these fossils should throw some light on evolution. Probably no types of animal life more primitive, and showing an equal amount of detail, have hitherto been discovered elsewhere. It is hoped that, when in the course of time more complete specimens have been secured, these fossils can be classed palaeontologically, and then they should help materially in establishing the stratigraphical succession of the older rocks of the Commonwealth. In regard to the latter, the author may be permitted here to refer to the great work done by one who, at the time of his death last January, was the doyen of all Australian geologists, the late H. Y. L. Brown. From the point of view of the vastness of the regions which he geologically mapped—in South Australia, Central Australia, Northern Australia, and Western Australia—and of his quickness at seizing salient points observed in his very long and arduous journeys over this continent. Brown was probably second to none among the geologists of the world. He, up to the last, was contributing notes for the excellent new Geological Map of South Australia just prepared under the direction of Dr. L. K. Ward.

(b) In extra-Australian Areas (Brief Summary).

Walcott, in his classical paper from which most of the references below are borrowed,[10] describes fossils from Pre-Cambrian rocks respectively in:—

(1) The Belt Series of Montana.
(2) Arizona, Grand Canyon Series, with *Chuaria circularis.*
(3) Avalon terrane of Newfoundland.
(4) Lake Superior Series, Steeprock Series (?), with *Atikokania.*
(5) New Brunswick Etcheminian terrane (?).

He suggests (p. 227) that *Eozoon* may be of organic origin.

MATTHEW, G. F.: Fossil Sponges from the Laurentian rocks of New Brunswick. Bull. No. 9, Nat. Hist. Soc. New Brunswick, pp. 42-45.

DR. CHARLES BARROIS: Radiolaria in the Pre-Cambrian rocks of Brittany. Sur le présence de fossiles dans le terrain azoique de Bretagne Comptes rendus des séances de l'Académie des Sciences, 8 août, 1892, 115, pp. 326-328, Gautier-Villers et Fils, Quai des Grands-Augustins, 55, Paris, 1882.

CAYEUX, L., described these later. *L. Cayeux:* Les Preuves de l'existence d'organismes dans les terrains précambriens. Bull. Soc. Geol. France, 3 Ser., 1894, pp. 197-228, with two rock profiles and pl. ii. Cayeux has also contributed the following two works:—

L. Cayeux: Sur la présence de restes de foraminifères dans les terrains precambriens de Bretagne. Comp. rend. Acad. Sci., 118, 1894, pp. 1433-1435, with 6 figures in the text; Ann. Soc. Géol. du Nord, 22, 1894, pp. 116-119, with 6 figures in the text.

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(9) Madigan, C. T., The Geology of the Fleurieu Peninsula, Trans. Roy. Soc. S. Austr., vol. xlix., pt. 1, pp. 198-212, pls. xvi.-xx. Also, Madigan, C. T., Organic Remains from below the Archaeocyathinae Limestone at Myponga Jetty, South Australia, *ibid.*, vol. l., pp. 31-35, pls. iv.-vi.

(10) Walcott, C. D., Pre-Cambrian Fossiliferous Formations. Bull. Geol. Soc. Amer., vol. 10, pp. 199-244, pls. 22-28, April 6, 1899.

L. Cayeux: de l'existence de nombreux débris de Spongiaires dans le précambrien de Bretagne. Ann. Soc. Géol. du Nord, 23, 1895, pp. 52-65, with pls. 1 and 2.

Dr. Hermann Rauff came to the conclusion that all the above forms were of inorganic origin. *Rauff, H.:* Neues Jahrbuch für Mineralogie, etc., 1896, bd. i., pp. 117-138.

Billings has described Pre-Cambrian fossils from Newfoundland. *Aspidella terranovica,* Billings, from Momable slates, Newfoundland, probably inorganic. *Arenicolites spiralis* is associated. Quoted *op. cit.,* p. 231.

Matthew, G. F.: Etcheminian of New Brunswick (Hanford Brook Section) describes [10a] in preliminary note about 20 species from the Etcheminian rocks, partly of New Brunswick, partly of Newfoundland (above Avalon terrane there but below the Cambrian). He states: "Various forms of the *Hyolithidae* are the dominant types. Other gastropods allied to *Capulus* and *Platyceras* occur, also brachiopods; remains of echinoderms (cystids ?) and corals allied to *Archaeocyathus* and *Dictocyathus*. The thin limestones which occur in the upper half of the terrane are supposed to have originated chiefly from foraminifera (*Globigerina,* etc.)."

Walcott states *(op. cit.,* pp. 232, 233) that in the Grand Canyon Series, in upper division of the Chuar terrane, a *Stromatopora*-like form, *Cryptozoön occidentale,* Dawson, occurs. And Walcott figures from the same Series a small discinoid brachiopod—*Chuaria circularis* (nov. g. and sp.), Walcott.

Walcott states further *(op. cit.,* p. 235) that Dr. Carl Wiman [11] has illustrated some small disc-like bodies from the Pre-Cambrian shales of the Wisings group "which may or may not be of organic origin."

In a later paper Walcott [12] describes two interesting fossil genera from Ontario. He also describes, in the above paper, certain fossils discovered in the lower limestone of the Steeprock Series under the name of *Atikokania,* of which he recognises two species, *A. lawsoni,* after the discoverer, Dr. Andrew C. Lawson, and *A. irregularis.* He also figures another fossil under the problematic name of *Cryptozoön.* The Steeprock Series rest with strong unconformity on that of the Keewatin. The series comprise limestones, ferruginous rocks, calc-schists, agglomerates, conglomerates, and dark-grey clay shales, have a thickness of about 5,000 feet, and are themselves intruded by granitoid porphyries and massive hornblende rocks. The exact geological age of the Steeprock Series has not yet been ascertained, but it has been variously referred to the Huronian and to the Archaean. Walcott compares *Atikokania* with the genus which Professor T. Griffith Taylor, in his Memoir in the *Archaeocyathinae,* calls *Syringocnema.* Walcott considers that *Atikokania* is a form intermediate between the sponges and the *Archaeocyathinae,* with a closer alliance to the former than with the latter.

Next, the same author [13] describes a great variety of new types of Proterozoic algae, occurring in the Newland limestone of the Belt Series of Montana. This series is separated by an unconformity from the Archaean complex below and the Cambrian fossiliferous strata above. Its thickness is estimated at 12,000 feet; the algal remains occur mostly in, and contribute to form, the Newland limestone, itself 2,000 feet thick, and they underlie the Greyson shales, which have yielded remains of several annelids in the form of trails, and one large species of crustacean, *Beltina danai.* Walcott considers *Beltina danai* to

(10a) Matthew, G. F., Amer. Journ. of Geology, vol. xxii., 1898, p. 252.

(11) Wiman, C., Bull. Geol. Inst. Upsala, No. 3, vol. ii., 1894.

(12) Walcott, C. D., Notes on Fossils from Limestone of Steeprock Series, Ontario, Canada, Can. Geol. Sur. Memoirs, No. 28, pp. 16-20, pls. 1 and 2.

(13) Walcott, C. D., Pre-Cambrian Algonkian Algal Flora, Smithsonian Miscell Collections, vol. 64, iii., No. 2, 1914, pp. 77-118, pls. 4-23.

be possibly of marine habit. He held that "the presence of great thicknesses of red sandstones and shales in the Algonkian Series of the Grand Canyon and Belt Series of Montana suggests an arid and possibly a cold climate." He thinks that the wonderful algal flora was developed in non-marine aqueous areas, and that it was mostly, if not wholly, resembling the *Cyanophyceae* (blue-green algae).

The remains of Beltina danai.—The trails of the annelids are figured in the above paper, pl. 21, and the crustacean remains on pl. 22. The latter is republished from Bull. Geol. Soc. America, vol. 10, pl. 25: Walcott, C. D., "The Pre-Cambrian Fossiliferous Formations."

The following is a further reference to *Beltina danai:* Walcott, C. D., Middle-Cambrian Branchiopoda, *Malacostraca, Trilobita,* and *Merostomata,* Smithsonian Miss. Coll., vol. 57, No. 6.

III. Geographical Distribution.

The fossils referred to are probably distributed over as wide an area as that occupied by the Adelaide Series, which extends in a north and south direction from near Willunga, south of Adelaide, to the Willouran Ranges, a distance of, approximately, 340 miles.

The above are the extreme measurements of the area known to be occupied in South Australia by rocks of the Adelaide Series, an area of, approximately, 14,000 square miles.

We may now consider the approximate area within which the fauna of the Adelaide Series has already been actually traced. The distance from Crystal Brook to Reynella and Hallett's Cove towards the south is, approximately, 120 miles. It may be stated, roughly, that at present the fauna has been proved to extend over an area of, approximately, 3,000 square miles. The localities where the fossils are known to occur are as follows, arranged in the descending order of their geological horizons:

7. (i.) Dolomitic limestones with abundant bristles of annelids. Pocock's Quarry, near Reynella, now South Australian Cement Company's Quarry.
   (ii.) Brighton limestones, near above Company's Cement Quarries, Brighton.
6. Siliceous Limestones underlying Brighton limestones:—
   (i.) Cement Works Quarry, Brighton.
   (ii.) Reynella, South Australian Cement Company's Quarries.
   (iii.) Field River, between Reynella and Hallett's Cove.
5. Tapley's Hill shales.
4. Thin limestones at base of preceding and immediately overlying Sturtian Tillite.
3. "Blue Metal" limestones, Devil's Elbow, Glen Osmond Road, and Beaumont Quarry, near Adelaide.
2. (i.) Upper Torrens limestone, Montacute, Sixth Creek, Torrens Gorge, etc.
   (ii.) Crystal Brook limestones and cherts.
   (iii.) Hack's Bridge, Mylor.
   (iv.) Coghlan, South Australia.
   (v.) Tenafeate Creek, near One Tree Hill, east of Smithfield.
1. Thin (2 feet) quartzite, perhaps below the Upper Torrens limestone, Tea Tree Gully, near Adelaide.

IV. Mode of Occurrence.

(a) On Weathered Rock Surfaces.

7. The most conspicuous form taken by such remains is to be found in the Buff limestone at the top of the Brighton limestone horizon. This type of evidence shows in the form of a markedly honeycombed surface. In some cases the pittings

are due to the weathering out of material filling in the burrows of annelids(?). But in some cases the pittings in the Buff limestone, which show as small conical depressions, are due to the weathering-out of the material of parts of the skeleton of the annelid. Immediately under this weathered surface innumerable irregularly-shaped small patches of orange-brown material become visible. Under the microscope, as will be explained presently, these show as more or less irregularly-bounded segments, or outlines of portions of annelids, occasionally with the bristles, and rarely with small portions of the other appendages preserved.

6. *Siliceous Limestones.*—In places in the valley of the Field River the whole rock is perfectly honeycombed with burrows. These are somewhat of the shape of an inverted heart in cross sections, the depressions on each side of the central ridge being evidently formed by the parapodia of the annelid. At Reynella these limestones weather into a soft, brownish crust, in which it is not easy to trace organic structure. Such, however, is present immediately under the crust in particles of ochreous calcareous material. This yellow-ochreous tint characterises the organic remains throughout the whole of the limestone, etc., horizons which contain the fossils, representing a vertical thickness of strata (including shales and quartzites) of from 10,000, probably to 12,000 feet. Such particles, for example, have been recognised in the Upper Torrens limestone of Mylor and Crystal Brook, as well as in the Upper Torrens limestone of Sixth Creek, near where it joins the Torrens River in the Torrens Gorge, as well as in the quartzite of Tea Tree Gully. There is obviously some significance in this yellow tint, which is to be connected with the mineral constitution of a fauna which, apart from soft-bodied animals, was doubtless largely chitinous, or formed of calcified chitin.

3. *"Blue Metal" Limestone.*—Where this limestone outcrops at the Devil's Elbow, on the Glen Osmond Road, and at the Beaumont Quarries, near Adelaide, clear traces can be observed, in the form of ferruginous to lemon-yellow small soft patches and streaks in the blue limestone, of annelids (?) from half an inch to 3 inches in length. Remains of Eurypterids, belonging to more than one genus, seem best preserved at the Beaumont Quarries. Probably the best specimens are likely to be secured in the future from the more shaly layers interstratified in the limestone, or immediately above or below it.

2. *Upper Torrens Limestones.*—Various organisms are to be seen on weathered surfaces of this limestone. Weathered specimens of annelids occur on the under surface of fragments of the Upper Torrens limestone, at Tenafeate Creek, near One Tree Hill.

Again, in the Upper Torrens limestone, at Sixth Creek, here and there spots may be noticed where segment-like joints have been dissolved out of the limestone. These show springing from them small casts of appendages, and are evidently of organic origin.

(b) In the Unweathered Rock. (i.) *Yellow to ochreous material.*—Reference has already been made to the occurrence in the Buff limestone of the Brighton horizon, of numerous setae and other appendages. The latter are preserved in a material which, by a transmitted light, has a golden-yellow tint. The larger organic fragments are ochreous-yellow, and on being etched, with diluted hydrochloric acid, they are left somewhat in relief standing out from their more or less translucent calcareous or dolomitic matrix. The larger fragments, particularly, apparently jointed carapaces, appear to have been much burrowed by minute organisms. Numerous very minute, spherical, reddish bodies are present in these burrows. Locomotory appendages for swimming or crawling are well preserved, though mostly in a fragmental state, as well as probable respiratory appendages, such as spiral gills, branchiae, etc. Antennae and antennules appear to be present, formed of this same ochreous material. In places, however, this is replaced by

clear calcite, the change always accompanied by loss of definition of the original outline. The *setae* are quite abundant, and in places give the limestone the character of a "bristle limestone." They are mostly replaced by calcite, but some are represented by black carbonaceous material. Others again, more rarely, are of a translucent warm amber tint. While this description applies specially to the Reynella siliceous limestones and to the overlying Brighton limestones, it is also valid for the "Blue Metal" limestone and the Upper Torrens limestone. The exact nature of the chemical composition of this ochreous substance has not yet been ascertained. It may be mentioned, however, that at the Devil's Elbow, even at a depth of over 20 feet below the surface, where the limestone is quite bluish-black, and generally free from decomposition, the ochreous fragments, though completely surrounded by this relatively impervious matrix, are thoroughly decomposed, so as to be perfectly soft.

(ii.) *Carbonised chitin (?).*—This can be well seen in the case of the animal remains preserved in the "Blue Metal" limestone. The black carbon of bristles, etc., is there quite well preserved, where it has not already been replaced by clear calcite. Bristles and spiral gills are also recognisable in the Tapley's Hill slates, in cases where the slate has been dissolved in hydrofluoric acid, and has yielded up its organic fragments in the form of carbonised or calcified limbs, segments, and breathing apparatus. It may be noted also that the external skeleton of the annelids is frequently preserved in black carbon.

(iii.) *Selenite (?) and calcite.*—In the Tapley's Hill shales the fossil remains are partly replaced by calcite and selenite, and on treatment with hydrofluoric acid extremely delicate structures, such as spiral gills, are exquisitely preserved in glassy calcite. So fragile are these that it was noticed that the mere tension of a drying drop of water, surrounding the calcite spiral, was sufficient to shatter it to pieces.

(iv.) *Limonite and haematite partly after pyrites.*—A single specimen of an annelid preserved in this substance is figured on pl. xvii., fig. 12.

V. Stratigraphical Sequence.

The descending section on opposite page, chiefly after Professor Howchin, is approximate only.

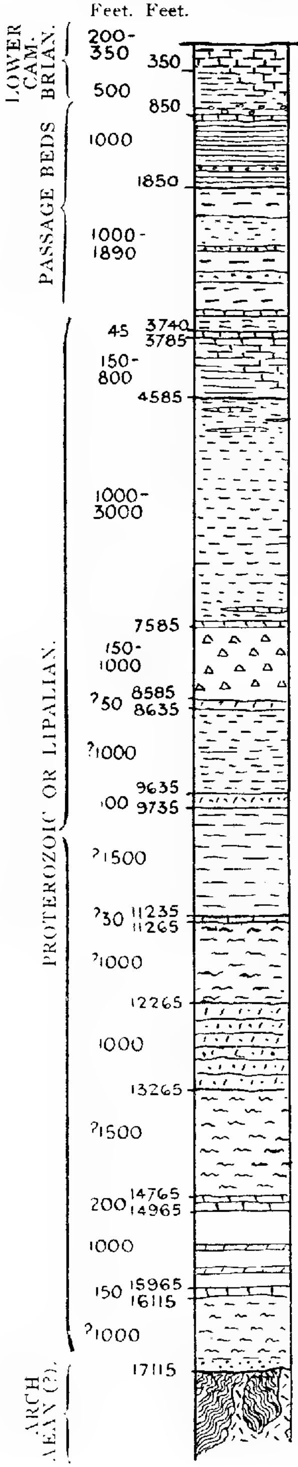
It will be seen that the top of the fossiliferous series, containing these archi-annelids and archi-arthropods, commences at an horizon of probably at least 2,000 feet below that in which C. T. Madigan has described fossil types of *Salterella*.[14] and [15] From here the series extends downwards to the horizon of the Lower Torrens limestone, some 10,000 feet to 12,000 feet below the base of the fossiliferous rocks of undoubtedly Lower Cambrian age.

It is interesting to note that the newly discovered fauna occurs both above and below the Sturtian tillite of Howchin. Both in the Tapley's Hill shales, and in the thin limestones overlying the tillites, remains of annelids occur, mostly, if not wholly (?) marine. It has been suggested by some that the Tapley's Hill, finely laminated, shales represent varves. As developed to the east of the Archaean axes of Broken Hill, in the Poolamacca and Torrowangie districts, where there is evidence of contemporaneous contortion of the shales, they may be of the nature of true varves deposited in glacial lakes. The presence, however, of these marine (?) fossils near Adelaide show that, at any rate, the upper beds of the

(14) Madigan, C. T., Organic Remains from below the Archaeocyathinae Limestone at Myponga Jetty, South Australia, Trans. Roy. Soc., S. Austr., vol. l., pp. 31-35, pls. iv.-vi.

(15) It may be noted that Cox, of the British Museum of Natural History, states in a private letter to the author that he considers these fossils identical with *Salterella planoconvexa*, Tate.

The following vertical section is chiefly after Professor Howchin, with additions from C. T. Madigan's papers:—



Archaeocyathinae limestones underlying *Redlichia* beds.

Black to dark-grey carbonaceous shales with phosphatic concretions with radiolaria and sponge spicules, and 8 feet bed of limestone with *Saltcrella planoconvexa*, Tate. This is lowest horizon, proved as yet, for fossiliferous Cambrian rocks locally.

Black slates and shales, weathering to claret colour.

Purple slate series with thin quartzites and a little thin oolitic limestone.

Brighton limestone, rich in remains of annelids and arthropods.

Siliceous limestones of Reynella, Field River, Burra, etc.

Tapley's Hill laminated calcareous shales and slates, with thin limestones at top and bottom.

Sturtian Tillite.

Subglacial quartzite.

Upper clay slate.

Glen Osmond quartzites.

Glen Osmond clay slates.

"Blue Metal" limestone with large annelids and eurypterids.

Upper phyllites.

The thick quartzite of Black Hill, Stonyfell, Mount Lofty, Mount Barker, etc.

Lower phyllites.

Upper Torrens limestone, Crystal Brook, Coghlan, Mylor, Tenafeate Creek, etc., limestones.

Phyllites and quartzites. Bed of quartzite, 2 feet thick, at Tea Tree Gully, very fossiliferous. Eurypterids abundant.

Lower Torrens limestone, much marmorised.

Phyllitic rocks with 150 feet of basal grit with much detrital ilmenite.

* Violent unconformity.

Schists, etc., intruded by basic to intermediate rocks of the Houghton Magma.

*Thus the base of the Adelaide Series is about 16,275 feet (4,924 metres) below the lowest Australian horizon of proved Lower Cambrian age.

tillite were probably deposited close to a shore line, just as are the glacial deposits now forming around the shores of Antarctica. Until the fauna has been worked out by palaeontologists and more field work accomplished, it will be premature to say whether, or not, there are disconformities present in the Adelaide Series. Professor Howchin has not recognised any up to the present. Thus the base of the Adelaide Series is about 16,275 feet (4,924 metres) below the lowest horizon of proved Lower Cambrian age.

VI. Preliminary Palaeontological Notes, and Description of Plates.

(a) The Upper Fauna.

These notes must be taken as merely introductory, as the author cannot claim to have any intimate knowledge of such a complex group as that of the arthropoda and annelids. It must be left to those palaeontologists who have the special knowledge to work out the forms in detail. Meanwhile, the author's only excuse for publishing these notes is to make known, through the Royal Society of South Australia, of which he has the privilege of being an Honorary Member, that there exists near Adelaide a very treasure-house for students of evolution, and particularly, he hopes that young palaeontologists in South Australia may be encouraged to work in this very difficult and yet most fascinating field. It must not be thought that even now the author has come upon complete specimens. Specimens showing even an approach to completeness are very rare, even in the minute forms. The best preserved, so far, are in the siliceous limestone of Reynella, in the calcareous Tapley's Hill slates, in the "Blue Metal" limestone, and in thin quartzite under the upper Torrens limestone. The limestone at Reynella is largely formed of myriads of *disjecta membra,* such as head-pieces, body-segments, tail-pieces, tentacles, spiral gills, antennae, antennules, chelae, jaws, bracts, bristles, etc., belonging to annelids, or arthropods. The limestone passes into oolite or dolomite, and though these rocks are usually unfavourable for the good preservation of fossils, some of the minute forms among the latter are in fair condition, and suggest a chemical deposition rather than a mechanical accumulation of the limestone in which they are embedded.

Pl. xiv.

On pl. xiv. are shown a photograph and three drawings of what the author believes to be chaetopods, probably allied to the sub-class *Polychaeta.* The fossil is faintly segmented, and shows distinct trace of the intestinal canal and the parapodia. The structure at the distal end is obscure. The expansion towards distal end seems due either to prostomial gill-plumes, or to an expansion of the animal's body just behind the head, or to the accidental superposition of some other fossil form. In regard to the minute bodies, fig. 2, about mm. ·3, of resinous appearance, these in shape somewhat resemble trochospheres like those of annelids, but may represent fructification of plants. They are unaffected by either hydrofluoric or hydrochloric acid. Fig. 4 shows a single segment of an arthropod with what appears to be a small chelate appendage attached. All are from the siliceous limestone, Reynella.

Pl. xv.

On pl. xv., fig. 1 illustrates a problematical body, possibly resembling *Stratiodrilus.* One of the appendages is shown enlarged in fig. 5. Figs. 2, 3, and 4 appear to be small arthropods, fig. 3 somewhat resembling the form figured as *Reynella howchini* on pl. xvi. Fig. 8 shows a small jointed limb, wonderfully preserved in view of its minuteness. All are from siliceous limestone, Reynella.

Pl. xvi.

The figures on pl. xvi. all illustrate the form *Reynella howchini,* n. sp. The length of this is 7 mm. and its width 4 mm., in its extreme measurement. As shown by the drawing, the animal's body is strongly segmented. It is impossible to count the number of segments in the section, but at least six are undoubtedly present. A unique interest attaches to the paired appendages, in that for the most part jointing is wanting, but the place of flexibility, normally afforded by joints, is perhaps taken by the horizontal spiral arrangement of the limbs in a spiral directed obliquely downwards and outwards, which must have imparted a certain amount of springiness to the limbs.

The most definite structure about the head-piece or cephalon is the remarkable and exquisitely-formed anterior appendage of the nature of a delicate scroll-like structure, ending perhaps in a long spirally-coiled antennule-like process. This is present on the right side of the head, but there is trace of a corresponding structure also on the left side. It is suggested that these may have been antennules; two or more antennae, small and short, measuring about mm. ·2 in length, and situated centrally, are also present. On account of the intense over-crowding of the Reynella limestones with these small arthropod bodies it becomes very difficult to decide, in many cases, which portions of the *disjecta membra* belong to which special organism, and which are contributed by closely adjacent, or even over-lapping organisms. No definite trace of eyes has been observed.

At least eight body segments appear to be present, and possibly more. Some segments are provided with a pair of spirally-coiled limbs terminating in two claw-like hooks. Attached to these are delicate spirally-coiled structures, evidently of the nature of breathing appendages, such as gills or branchiae. The reader is referred to the illustration on pl. xv., of what the author conceives to be the chief structure of such of the appendages, as far as he was able to trace them out, with the help of a good binocular microscope. Unfortunately, the plane in which the section has been cut appears to have, to some extent, missed the animal's tail. The part of the drawing which shows this portion must be considered to be incomplete. The small body enlarged in fig. 4*a* of pl. xvi. may possibly be a small brachiopod attached by a muscular peduncle. There is evidence of parasitic brachiopods on the eurypterids, as mentioned later.

The author proposes the name *Reynella* for this organism, after the locality of its occurrence, and as this is the first of this fossil fauna that has been observed at all approaching completeness, he wishes to add the specific name *howchini*, in honour of his colleague, who has so greatly enriched geological knowledge by his discovery and systematic mapping of the Sturtian tillites and other members of the Adelaide Series, as well as of the overlying fossiliferous Cambrian rocks.

Possible Algal Flora.—On pl. xiv. reference has already been made to the possible plant remains shown in fig. 2, *a-j*. These occur, like the form in fig. 1 of pl. xv., in a greenish calcareous rock underlying the siliceous limestone at Reynella and in the Field River Valley between Reynella and Hallett's Cove.

This rock represents the most wonderful and beautiful development of the siliceous limestone, viz., the fine-grained greenish variety, which is well seen in weathered outcrop just below the old copper mine on the Field River, about a mile and a half up the river from Hallett's Cove. This rock weathers characteristically into a dark-brownish surface covered with delicate crinkled laminae. These anastamose in places, and here and there appear to be united to structures like small pillars, but it is possible that these merely represent the vertical burrows of annelids. The laminae are of the order of mm. ·25 to mm. ·2. Occasionally,

but rarely, they attain a thickness of 1 mm. Their distance apart is variable, but is of the order of about mm. 1 to mm. 1·5. Seen under the microscope by transmitted light this whole rock is a perfect fairyland. The crystalline laminae resolve themselves into olive-green to pale bronze-green, somewhat foliaceous structures. The crinkling gives them a somewhat twisted rope-like appearance, and an endless variety of delicate shapes, some almost colourless, and all of them showing very definite structure, emanate from these delicately-coloured laminae.

In places the organic-looking laminae are edged with groups of minute resinous-looking bodies about mm. ·1 in diameter. Here and there are structures resembling the capsules of mosses of a dull-green tint, with strongly-marked longitudinal lines, having somewhat the appearance of a minute green corn cob. They have twisted colourless stems; examples of these are shown in fig. 2, *i* and *j*, pl. xiv. While these so closely resemble plant material, it must be understood that they are far more minute than the fructification structures of modern plants. At the same time it is difficult to imagine mineral matter, even in its extreme vermiform types, simulating in such an extraordinary way organic structures. In among the pale greens of the laminae are small bodies closely resembling fruits or minute spore-cases of a deep orange to translucent resinous tint. These are illustrated on pl. xiv., *a-h*.

In the form shown in fig. 2*h*, pl. xiv., the delicate, scroll-like, colourless structures above the resinous sporgangium (?) almost suggest the shape of elaters, and near by are minute spherical bodies about mm. ·03 to mm. ·05 in diameter Occasionally remains of annelids are visible in this rock, as is shown in fig. 7, pl. xv. Professor T. G. B. Osborn has kindly examined some of these slides, but hesitates to hazard the opinion that the green laminae with their various foliaceous structures, and the capsule-like, or sporangia-like, green and orange forms, are really plant material at all. His doubts are chiefly based on the fact of the extreme minuteness of so many of these structures, the whole organism, in the case of the sporangia-like forms, being no bigger than a small cell of a modern plant. The only structures in this rock which Professor Osborn considers are almost certainly of plant origin are the almost colourless short and rather thick anastomasing laminae, which should be figured by a palaeobotanist when better material is available. The origin of this rock, so full of exquisitely beautiful forms as to be quite a palaeontological romance, is at present an absolute mystery. The exact thickness of the rock has not yet been ascertained, but it is probably of the order of at least 100 feet to 200 feet.

In the middle and lower portions of the Tapley's Hill shales occasional annelid burrows occur, and remains of annelids are seen in the thin limestones immediately overlying the Sturtian Tillite. This is obviously a feature of no little interest as bearing on the question as to whether the underlying tillites are of terrestrial origin, or partly of the nature of marine boulder clays. It is not yet certain that the annelids in these shales were polychateous. Some of those in the Brighton limestone certainly were so, and were, therefore, probably marine. Part of a small annelid from these slates or shales preserved in limonite forms fig. 12 of pl. xvii.

In reference to the actual size of the annelids, those from Reynella measure up to about one inch and a half in length (mm. 38) and about one-sixteenth to one-tenth of an inch (mm. 2-mm. 2·5) in width. The (?) dwarf fauna, which ranges from the top of the Brighton limestone to at least the base of the Tapley's Hill slates, has not, so far, been traced below the glacial beds of the Sturtian Tillite. Its vertical range is, perhaps, 1,200 to 2,000 feet; but the strata have not been systematically examined for fossils below the tillite until the important horizon of the "Blue Metal" limestone is reached.

(b) The Lower Fauna, with Arachnida.

The next horizon in which fossils have been found, and the one in which numerous large forms, fragmental, but of unique interest, occur, is that of the "Blue Metal" limestone with its associated argillaceous beds. The thickness of the limestone is variable, but appears to be from 30 to 50 feet thick where quarried, respectively, at the Devil's Elbow, on the Glen Osmond Road, and at the Beaumont Quarry. Annelids appear to be present, but as Arachnida are undoubtedly present in some number, some of the more delicate of their appendages may easily be mistaken for annelids.

Pl. xvii.

The forms figured on pl. xvii., figs. 5 and 6, and particularly that shown in fig. 11, *a* and *b*, are most probably annelids. They vary in length from about 3-5 cm. They are all from the Devil's Elbow Quarry.

In regard to the form shown in fig. 1, *a, b,* and *c,* the author is quite unable to determine the organism. Neither has the form shown in fig. 2, *a, b,* and *c,* of the above plate been determined. Both are from the Devil's Elbow Quarry.

The form in fig. 3 closely resembles one of the *Hemiaspidae,* and may belong to them. Beaumont Quarry.

In fig. 4 the left and central division represent the faulted (with a little overthrusting) cephalo-thorax of a eurypterid, while the right-hand division is part of one of its principal pair of appendages. Devil's Elbow.

Fig. 7 of pl. xvii. This is certainly one of the appendages, probably an ectognath, of the prosoma of a eurypterid-like arachnid. It is lying on the same slab as the claw shown in fig. 1, *a, b, c, d,* of pl. xviii., and the swimming paddle, fig. 6a, of the same plate. Length of specimen, 6 cm. Beaumont.

Fig. 8 is a photo. of a plasticene cast of a plate of some unknown arachnid, probably allied to *Eurypterus pustulosus,* Hall. Devil's Elbow.

Fig. 9 represents a highly problematical form widely distributed throughout the lower portion of the Adelaide Series from the "Blue Metal" limestone inclusive to the quartzite below (?) the Upper Torrens limestone. It is a large form, measuring 15 cm. Possibly these may represent detached branchiae of a eurypterid. Beaumont. The form shown in fig. 10 of pl. xvii. is rather remarkable. It was at first taken by the author to be possibly the head of a trilobite, but a closer examination showed that it is certainly not, but it much resembles the glabella of a trilobite, but is certainly not a glabella. Possibly in this annelid-like form may be represented a remote ancestor of the trilobites. The portion of the specimen figured was naturally weathered out of the rock. Beaumont.

Pl. xviii.

On pl. xviii., fig. 2 is an annelid showing head, proboscis, and a few of the parapodia. Crystal Brook limestone, probably on the horizon of the Upper Torrens limestone. Fig. 3 is the metastoma (post-oval plate) of a Eurypterid of the order of (?) 14 inches (35 cm.) in length. Tea Tree Gully quartzite. Fig. 4 shows the details of the *seta* of an annelid from Crystal Brook, the associated spiral process presumably was of a respiratory character. Fig. 5 is possibly the cercopod of an annelid. Upper Torrens limestone. Fig. 6 is an unknown organism in the phyllites under the Upper Torrens limestone at Montacute. The chief interest attaches to fig. 1, *a, b, c,* and *d,* which illustrates a remarkably well-preserved claw (?) represented by a hollow cast. The figure is taken from a positive cast, in plasticene, of the hollow. Even a trace of the surface ornamentation of the claw is preserved. At least one other pair of appendages, in this case swimming paddles (?), is preserved close alongside of the claw. This is shown in fig. 6 *a.*

It is hoped that sufficient of this merostamatous-like arthropod will soon be discovered to admit of a systematic position being assigned to it. The total length of the specimen, in view of the size of its appendages, must surely have been of the order of 8 inches (20·5 cm.).

The important find of the block of limestone containing the casts of this arachnid was made at the third of the old Beaumont quarries, going eastwards from the most recently-worked quarry, by the Rev. P. C. Eckersley, of Wesley College and the Geology School of the Adelaide University, when helping the author recently in the search for fossils. In view of the detailed characteristics of the claw and paddle, the author ventures to name this form, and to call it *Beaumontia eckersleyi,* respectively, after the locality and the discoverer.

In fig. 8 is illustrated the carapace with probable eye of a large arachnid, whose carapace had a width of about 6 cm. The eye measures mm. 5 by mm. 3·5 Devil's Elbow.

Descending now through a thickness of some 3,500 feet of phyllites and quartzites one reaches the Upper Torrens limestone. Professor Howchin estimates its thickness at about 200 feet. At Tenafeate Creek, near One Tree Hill, to the east of Gawler, this contains numerous fossil annelids, showing some structure on weathered surfaces of the rock. Some of the original chitin of the annelid's skeleton appears to be preserved in the Tenafeate limestone. This Upper Torrens limestone is obviously rich in fossils, but they are fragmental, as far as yet determined. Below the Upper Torrens limestone is a bed of quartzite literally teeming with organic remains. This is well seen in the small branch gully leading up from Tea Tree Gully, near Adelaide, to the old iron mine, and about one-quarter of a mile below the mine. The quartzite bed, intercalated in the phyllites, is only about 2 feet in thickness.

Mr. A. R. Alderman, lecturer in geology at Adelaide University, and the author recently found at this locality portions of two carapaces of an arachnid, probably one of the Merostomata. The following is a brief description of that found by Mr. Alderman, and shown on pl. xviii., in fig. 7, *a* and *b*:—The carapace is formed of blackish material (probably carbonised chitin) as distinct from the ochreous to lemon-yellow material in which most of the fossils are preserved. Measurement of carapace: Width in millimetres, 48 mm. to 50 mm.; length, 30 mm. Eyes showing faintly centrally situated distant about 10 mm. from each other, and 12 mm. in advance of the posterior margin of carapace. Greatest diameter of slightly elliptical eyes about 3 mm. The carapace is semi-elliptical in outline. At the distance of about 35 mm. forwards of the right lateral margin there is the base of an appendage, oval in outline, measuring about 2 mm. by $2\frac{1}{2}$ mm., making an angle of about 45° with posterior margin of the carapace, and at a distance of about 25 mm. beyond the margin of the carapace is a fin-like appendage. This appendage is about 60 mm. in length by 25 mm. in width. Its general appearance is shown on pl. xviii., fig. 7 *c*. In view of the fact that the whole rock has been subject to a considerable amount of lateral compression, with the development of much faulting and close-jointing, it is more than probable that the ridges on this appendage are partly, at least, of an inorganic structural origin. At the same time, the convergence of these structures in the direction of the carapace is very suggestive of their being, in part at least, original organic structures. Close to where the first specimen was found portion of a second carapace was obtained, also semi-elliptical in shape, and measuring 30 mm. in length by 50 mm. in width across the portion preserved. Probably the whole carapace when restored had a width of about 65 mm. This form when complete would probably have been of the order of about 8-10 inches (20·5-26 cm.) in length. Numerous body segments are present both in this quartzite at Tea Tree Gully as well as in the "Blue Metal" limestone. At Tea Tree Gully the thickness of the segments is

about 2·5 mm., and their width 30 mm., and their length 15 mm. On this specimen a total length of about 60 mm. is occupied by, apparently, four body segments lying close together. To judge from the number of body segments, or portions of them, preserved in the Tea Tree Gully quartzites, these Eurypterids (?) must have been quite numerous in the contemporaneous fauna.

It may be added that so far the only trace of possible brachiopods in this fauna of the Adelaide Series is to be found in small depressed areas on Eurypterid plates, where parasitic brachiopods have apparently countersunk themselves into the plates, as explained to the author by Mr. Frederick Chapman.

Fig. 9 of pl. xviii. is probably the telson of an arachnid. It measures 25 mm. x 11 mm. in length. It is larger than, but otherwise not unlike that figured from the Silurian rocks of Maryland, U.S.A., and referred to a *Pterygotus*.[16] Fig. 10, *a* and *b*, represent an undetermined form from Nullagine or possibly Lower Cambrian rocks, Argyle Downs, Kimberley West.

VII. Summary.

1. In South Australia the existence has now been proved of a fragmental, but at the same time an abundant and varied fauna of annulata and arthropoda, over an area of some 3,000 square miles. As the same series of strata, in South Australia, has a total area of about 14,000 square miles, the area of the fossiliferous rocks is probably co-extensive.

2. The fossils occur entirely in rocks of the Adelaide Series, throughout a vertical range of about 10,000 feet to 12,000 feet of strata, especially in all the limestone horizons, as well as in the Tapley's Hill slates, the shaly strata associated with the "Blue Metal" limestone, the quartzite of Tea Tree Gully, etc.

3. The newest of the fossiliferous horizons, now proved in the Adelaide Series, viz., that of the Brighton limestone, is about 2,000 feet, stratigraphically, below the horizon of the *Archaeocyathinae* limestone, which latter is immediately beneath the *Redlichia* beds, and is, therefore, referable to the Upper Division of the Lower Cambrian. Consequently these fossiliferous rocks of the Adelaide Series range from about 2,000 feet to 12,000 feet below the base of the oldest rocks, in which undoubted Lower Cambrian fossils have been traced in Australia.

4. It may be noted that so far no trace has been found in Australia of the trilobite zones referred to in a previous paper by the author,[17] *Olenellus* zone, *Callavia* zone, *Ellipsocephala* zone, *Nevadia* zone. Dr. F. W. Whitehouse has pointed out that these zones have not been identified in China, and appear to be wanting—perhaps never were developed—over the greater part of Asia. These trilobites may never have reached Australia, but the equivalents of their zones in time may possibly be represented in the passage beds some 2,000 to 3,000 feet thick between the base of the fossiliferous Cambrian and the top of the Adelaide Series proper, the Brighton limestone, in the Adelaide area.

5. *Age.*—This new fauna may possibly belong to *(a)* basal Lower Cambrian, but in view of the apparent entire absence of trilobites, and the remarkable characteristics of the fauna, as, for example, the spirally-rolled limbs of some of the small forms, the unique character of the arachnids, and the apparent chitinous character of the fauna, the author considers that the fauna is probably older than the oldest Cambrian. *(b)* It might be suggested that the peculiar character of the fauna of the Adelaide Series, so unlike that of the Cambrian, may have been due to its deposition in some vast epicontinental lake possibly in Lower Cambrian time; but against this is the prevalence of polychaetous annelids

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(16) Maryland Geological Survey, Silurian, pl. lvii., fig. 6. Telson of a Pterygotus, McKenzie formation, Keefer sandstone, near Lock 53, 3 to 4 miles west of Hancock, Md. Baltimore. Johns Hopkins University, 1923.

(17) David, T. W. E., Note on the Geological Horizon of the Archaeocyathinae, Trans. Roy. Soc. S. Austr., vol. li., pp. 410-413, with Table.

throughout most of the 10,000 feet of strata, and of merostomatous-like arachnids in the middle and lower portions of the Series, and also the considerable thickness of the limestones, viz., up to at least 400 feet. The author would suggest, tentatively, that to adopt C. D. Walcott's term, it may be considered *(c)* Lipalian, that is, belonging to the time represented in North America, by the unconformity between the top of the Keeweenawan and the base of the Cambrian. On the other hand, it may be *(d)* Proterozoic (Algonkian), possibly homotaxial with the Keeweenawan, but, unlike it, the Adelaide Series appears to be fairly conformable with the Lower Cambrian.

6. The fossils, both annulate and arthropod, though mostly obscured and distorted by rock pressures, are in the case of the minute forms wonderfully preserved, even the most delicate spiral breathing appendages being recognisable; and yet the age of these fossils, as estimated by radio-active methods, may be of the order of six hundred millions of years. The appendages, too, of larger forms such as the arachnids are in some cases fairly well preserved.

7. The fauna seems to have been largely chitinous, and, in places, the annelid setae so abound as to constitute, locally, almost a bristle limestone.

8. The phenomenally good state of preservation of the minute fossils appears to be due, in the case of the "siliceous limestone," to chemical precipitation of the lime.

9. Incidentally, the fauna being mostly marine, and occurring immediately above Howchin's "Sturtian Tillite," the tillite may have been deposited along, or close to, a shore line.

10. A flora, probably algal, not yet described, is present with the fauna.

11. The life forms hitherto found in the Adelaide Series may be summarised as follows:—

PLANTAE—

Algae. *Mawsonella wooltanensis,* Chapman, west of Wooltana, N.E. Flinders Ranges, S.A.

Incertae sedis.

Possibly in Ordovician Rocks.
Cryptozoön. Italowie, N.E. Flinders Ranges, S.A.
Cryptozoön australicum, Howchin, and *C. tessellatum,* Howchin. Acacia Well, south of Arltunga, Central Australia.
Cryptozoön. Ooraminna Rockhole, south of Alice Springs.

ANIMALIA—

Phylum *Protozoa* Radiolaria.
Phylum *Vermes.*
Polychaetous annelids.
Phylum *Molluscoidea,* Class 2, Brachiopoda. Small parasitic brachiopods (?).
Phylum *Arthropoda.*
Class 2, *Arachnida.*
Sub-class A, Merostomata.
Types of *Hemiaspidae?*
Several types of *Eurypterida* allied to Eurypterus, Stylonurus, etc.

By far the larger number of the fossil forms cannot yet be classified.

12. Palaeontologists have, in the Adelaide Series, ample material for determining its age; but the fossils will probably need years for their elaboration, unless, as is quite probable, zones are soon discovered in the Adelaide Series, particularly in the little disturbed areas of the Flinders Ranges, where the rocks and fossils are less altered than near Adelaide. Even near Adelaide such zones may yet be found, in the very near future, and already the Beaumont Quarries and Tea Tree Gully quartzites are yielding very encouraging results.

Surely the geologists of South Australia have a goodly heritage!

VIII. Acknowledgments.

The author is specially indebted to Professor W. Howchin for his constant collaboration for so many years, which has so materially assisted in the find of fossils just described. He is also grateful to Sir Douglas Mawson for much help in the field, and to him and to Dr. L. K. Ward, Messrs. H. Y. L. Brown, R. L. Jack, and C. T. Madigan, for much assistance in the interpretation of the sequence of the Adelaide Series; and to Messrs. C. T. Madigan and H. E. E. Brock for assistance in the preparation of illustrations, lantern slides, micro-slides, and etched specimens for the purpose of this paper. He also desires to specially thank Mr. A. R. Alderman, M.Sc., and the Rev. P. C. Eckersley, for valuable assistance in the field, as well as Mr. H. H. Blackham, and wishes to thank, for motor transport facilities, Lady Mawson, the Rev. S. Forsyth, the Rev. W. O. North, and Mr. W. L. Jack. He is also indebted to Mr. H. G. Gooch, of the Geology Department of the University of Sydney, for the micro-photographs and other photographs, and to his other colleagues, Professors L. A. Cotton and W. R. Browne, and Mr. W. S. Dun, for much useful advice and co-operation. He also wishes to thank Mr. E. A. Briggs, of the University Zoology Department, for loan of drawing apparatus and advice, and is grateful to Dr. F. W. Whitehouse for useful criticism, and to the Federal Palaeontologist, Frederick Chapman, for the interesting information about brachiopods occurring parasitically on Eurypterid plates. He owes to the kindness of Professor E. de Courcy Clarke the rocks from Kimberley, W.A., in which the fossil fig. 10*a* of pl. xviii. was found. Last, and not least, of the acknowledgments of the author are due to the generous and gratuitous help of Mr. W. Weidenbach in the preparation of the plates illustrating this paper.

DESCRIPTION OF PLATES XIII. TO XVIII.

The plates of fossils, XIV. to XVIII., are arranged in descending stratigraphical order, commencing with the Brighton limestones at the top of the Adelaide Series, and extending downwards for about 10,000 feet to below the Upper Torrens limestone, near the base of the series.

Plate XIII.

In addition to the explanation on the plate itself, it may be added that the correlation of the Adelaide Series with the Nullagine at present rests on a slender basis, so far as palaeontological evidence is concerned. On lithological grounds there is reasonable evidence for their correlation, if the great basic volcanic series of the Antrim Plateau and Nullagine can be correlated with one another, as well as with the lavas of the Townsend Range and Wooltana, the latter 300 miles northerly from Adelaide. The Nullagine area lies in Western Australia between the parallels of 20° and 27° S., and the meridians of 115° and 124° E. The Kimberley development of the Nullagine Series, extending eastwards nearly to the Gulf of Carpentaria, lies mostly between the parallels of 13° and 20° S., and the meridians of 125° and 137° E. It is doubtful whether the two small patches shown on the meridian of 135°, one just south of the Tropic of Capricorn, and the other a little to the north of it, are really referable to the Nullagine. They may be of Ordovician age.

The eastern boundary of the Nullagine-Adelaide Series between the Tropic of Capricorn and the parallel of 36° S. is not known, chiefly on account of the extensive covering of newer rocks in this direction.

The total area formerly occupied by rocks of this age (Lipalian to Proterozoic) in Australia was probably of the order of 1,000,000 square miles.

Plate XIV.

Fig. 1. (a) Microphotograph of a probable polychateous annelid, showing on the right a fringe of delicate parapodia. Length of portion preserved, 19 mm. (b) Drawing of preceding, showing trace of the intestinal canal. Length, 16 mm. (c) Is a drawing of another annelid with a curious expansion towards the distal end. Length, 15 mm. (d) Enlarged drawing of portion of preceding at the first bend shown about one-third of the

way up from the bottom of the preceding drawing. This shows traces of segmentation, with probably the intestinal canal, and on the right the delicate parapodia.

Fig. 2. The small objects lettered a, b, c, d, e, f, g, h, and k are all formed of a more of less resinous translucent to orange material. None of the above forms are affected by either hydrochloric or hydrofluoric acid. They are mostly of the order of about 0·3 of a millimetre in diameter, while d is about 1·5 mm., and c less than 0·1 mm. Form k may represent the trochosphere of an annelid, or possibly the fructification of some cryptogamnic plant; i, and j are of a greenish tint with a whitish-grey to colourless stalk-like process. Outwardly they resemble somewhat the capsules of mosses, but, of course, are far more minute, being of the order of 1·3 mm. in length.

Fig. 3 is apparently an arthropod showing at least three segments, and a strongly developed anterior process, like that of the antenna of a *peripatus* (the other one has been missed by the micro-section). Total length, about 4 mm. Its affinities are extremely doubtful.

Fig. 4 is portion of a jointed arthropod, of which only the carapace, or possibly a body somite, is visible, and attached to it is a jointed process which appears to be chelate at its distal end. Length of portion of carapace shown, about 6 mm. Length of chelate appendage, 1 mm. All are from the siliceous limestone, Reynella.

Plate XV.

Fig. 1 is a photograph (by H. G. Gooch) of a problematical body, possibly allied to *Stratiodrilus*. It has been suggested that it is not necessarily organic at all, but is formed by the junction of two or more crinkled laminae of inorganic origin. The process at the right-hand top angle of the central object is shown enlarged in fig. 5, and there can be little doubt that it is circular in cross section, and either a close spiral, or formed of small closely apposed discs. The portion preserved in the micro-section is about 4 mm. in length.

Affinities extremely doubtful. Locality, Field River, between Reynella and Hallett's Cove.

Fig. 2 appears to be a small arthropod. Anteriorly placed are two pairs of spirally-coiled processes, probably of respiratory or tactile function. Possibly the anterior pair are tactile and the posterior respiratory. There appear to be four pairs of appendages on the left side of the fossil. The total length is 1·8 mm. Locality and horizon, siliceous limestone, Reynella.

Fig. 3 is a drawing of apparently a small arthropod of unknown affinities. On account of the overcrowding of microzoal life in this part of the rock, it is doubtful whether the spiral process near the lower left-hand corner of the drawing really belongs to this specimen. This has some resemblance to the form figured as *Reynella howchini* on pl. xvi. Length, 4 mm.

Fig. 4 is a portion of a somewhat larger arthropod, the portion shown being about 6 mm. in length. The organism, when whole, was apparently twice to three times that length.

Fig. 5 is an enlargement of the appendage (?) at the upper right-hand portion of the central object in fig.1.

Fig. 6 shows a small heart-shaped body, of greenish-yellow colour, in contact with a spiral process below, and with a seta-like process above. The length is only 0·12 mm. The detail is wonderfully preserved in view of the minuteness of the object.

Fig. 7 appears to be the head of an annelid provided with tactile organs. Locality, Field River. Length, about 2 mm.

Fig. 8 is a very minute jointed limb only 0·25 mm. in length. Like fig. 6, it shows wonderful detail in view of its minuteness. Locality, Field River.

Plate XVI.

All the figures on this plate illustrate the form *Reynella howchini*, n. sp., except perhaps fig. 4 a, which may be a small parasitic brachiopod, which shows traces at its distal end of spirally curved processes, possibly the cirriferous processes. It is attached to the main organism by a stalk, or muscular peduncle. In view of the presence of what were almost certainly parasitic brachiopods on the plates of the Eurypterides, in the lower fauna, described on pl. xvii., the presence of brachiopods in the upper fauna might reasonably be anticipated. At the same time, it is possible that this small organism is a respiratory bract, but the brachiopod explanation seems more plausible. The details of *Reynella howchini* have already been given on p. 200. Locality, Reynella, south of Adelaide.

Plate XVII.

All the forms figured on this plate except fig. 12, and all those on pl. xviii., belong to the infra-glacial fauna. Those on pls. xiv.-xvi. inclusive belong to the supra-glacial fauna. The sub-glacial (below the Sturtian tillite) lower fauna is characterised by numerous Eurypterids.

Pl. xvii. has already been explained on p. 202. It may be added that the forms in figs. 5 and 6 are almost certainly annelids, probably gephyrean. They are, respectively, 39 mm. and 20 mm. in length. Fig. 11, a and b, illustrates a probable gephyrean, the enlargement b giving some details of the leech-like cercopods. Locality, Devil's Elbow Quarry, Glen Osmond Road, near Adelaide. Fig. 12 shows the posterior half of a small annelid from the Tapley's Hill slaty shales, which immediately succeed the Sturtian Tillite. It shows traces of the cercopods. It was apparently provided with scales. Length, 5 mm. Locality, Tapley's Hill, near Adelaide.

Fig. 1, a, b, and c, represent one and the same organism. Fig. 1 a is a photograph of a plasticene cast from the negative mould, the organic portion being only that which is shown on fig. 1 b. The large portion measures 31 mm. by 20 by about 3·5 mm. thick. It is doubtful whether the four joints shown belong to the large portion b. Part of the top of the object as figured has been broken off. The author is unable to classify this specimen. Remains of Eurypterids are plentiful on this horizon, and it is possible that this form may represent some nepionic stage in the development of one of the *Merostomata*. Locality, Devil's Elbow Quarry, Glen Osmond, near Adelaide, from the horizon of the "Blue Metal" limestone.

Fig. 2, a, b, and c, illustrates what is certainly an organic body, as it is preserved in the usual friable ochreous material common to all these fossils, and, besides, shows a little but obscure organic structure. Its affinities are doubtful. It measures 17 mm. by 10 by about 4. Locality, Devil's Elbow, "Blue Metal" limestone.

Fig. 3 may represent the anterior portion of one of the *Hemiaspidae*.

Fig 10, a and b, somewhat resembles the glabella of a trilobite, but is certainly not to be referred to the trilobites. It is a definite segmented organism of doubtful affinities. It measures 10 mm. by 10 by 6. Locality, Beaumont Quarry, near Adelaide. Horizon, "Blue Metal" limestone.

The forms shown in the remaining figures probably all belong to the *Merostomata*.

Fig. 4 represents the cephalo-thorax and portion of one of the right appendages of a Eurypterid of some size. The measurement over all is 120 mm. The left-hand portion, measuring 47 mm. has been fractured and overthrust over the right-hand portion, the latter being the middle portion of the three pieces. The broken carapace has also been slightly compressed antero-posteriorly, so that it yields a concavo-convex section at right angles to its long axis, the convex side being uppermost. This is a larger cephalo-thorax than that shown in fig. 7 of pl. xviii., as even in its present condition of being slightly overthrust on itself it measures about 82 mm. in width, as compared with 50 mm. for the width of the carapace (fig. 7) from Tea Tree Gully, near Adelaide. The portion preserved of the swimming appendage to the right of the carapace measures about 56 mm. The specimen is too much distorted to admit of its classification further than that it belongs to the Eurypterids. Locality and horizon, Devil's Elbow, "Blue Metal" limestone.

Fig. 7 illustrates one of the large pair of posterior appendages, the swimming legs, of an undoubted Eurypterid from the horizon of the "Blue Metal" limestone at the Beaumont Quarries. This is one of five appendages which were found dismembered, but almost touching one another, in one and the same slab of siliceous limestone. Fig. 1, a, b, c, and d, and fig. 6 a belong to the same specimen. The drawing, fig. 7, is from a plasticene cast of the negative hollow. The spine-shaped processes appear to be specially characteristic of this form, which is named by the author after the locality of its occurrence and the name of the finder (the Rev. P. C. Eckersley), *Beaumontella eckersleyi*, n. sp. The author wishes it to be understood that, in case some of these limbs represent more than one individual, he wishes the name applied to the form to which the claw-like appendage of fig. 1 belongs. Fig. 8 is portion of the cephalo-thorax of a Eurypterid, which, to judge from the tubercles on the plate, appears to be allied to *Eurypterus pustulosus*, Hall. It measures 35 mm. by 24 mm. Locality and horizon, Devil's Elbow, "Blue Metal" Limestone.

Fig. 9 is a specially remarkable form. It is of considerable size, and widely distributed horizontally and vertically, ranging through at least 5,000 feet of strata. The length of the portion preserved measures 150 mm. It consists of at least six paired structures. They were evidently rather delicate, as they almost always occur much pressed together and distorted. They seem to be formed of a network which was originally chitinous, so that the possibility of their being sponges is excluded. In view of the fact that their measurements agree closely with those of the Eurypterids it is suggested, very tentatively, that

these structures may have been of the nature of paired branchiae, but until better preserved material is obtained this is mere guesswork. Locality and horizon, Beaumont Quarries, "Blue Metal" limestone.

PLATE XVIII.

Fig. 1, a and b, are photographs of one and the same appendage of a Eurypterid. Fig. 1, c and d, are drawings showing the shape and dimensions of the appendage. Its length is 38 mm. The claw-like appendage is attached at its proximal end to a powerful joint. The palp-like portion at the distal end, measuring 12 mm., was separated by a joint from the rest of the appendage. No trace of teeth, like those of the claw of a *Pterygotus*, were detected. It is suggested, very tentatively, that this was one of the pair of appendages next, anteriorly, to the main pair of paddles (the latter being the ectognaths as represented in fig. 7 of pl. xvii.). Locality and horizon, Devil's Elbow, "Blue Metal" limestone.

Fig. 2 is an annelid, showing the head, proboscis, and a few of the parapodia. This was probably a polychaetous form. It is *in situ* in a burrow in the limestone at Crystal Brook, in South Australia, probably on the horizon of the Upper Torrens limestone. Length, about 4 mm.

Fig. 3 is the metastoma (post-oral plate) of a Eurypterid, which latter was probably of the order of a foot (305 mm.) in length, from Tea Tree Gully. This is 42 mm. in length, and is about 2·75 mm. thick. At its distal end faint traces are preserved of a cast of the space between the teeth of the ectognaths. Locality and horizon, Tea Tree Gully, quartzite below (?) the Upper Torrens limestone.

Fig. 4 gives the details of a seta attached to one of the parapodia (B), shown white, which in turn is attached to the body of a polychaetous annelid. This annelid is *in situ* in its burrow in the Crystal Brook limestone. The seta and its terminal filament together measure 0·2 mm. in length. Locality and horizon, Crystal Brook, Upper Torrens limestone.

Fig. 5 represents possibly the cercopods of an annelid. It appears to be preserved in the form of a blackish sub-translucent chitin. Length, about 10 mm.

Fig. 6 is a laminar body, apparently spicular. Possibly a sponge-like *Hazelia palmata*, Walcott. It has been much compressed, and distorted by pressure. Length, 45 mm. Locality and horizon, Montacute, near Adelaide, in phyllites underlying the Upper Torrens limestone.

Fig. 6 a represents part of the large swimming paddle of the Eurypterid to which belonged the appendages seen in fig. 7, pl. xvii., and fig. 1 of pl. xviii. Length, 40 mm. Locality and horizon, Devil's Elbow, "Blue Metal" limestone.

Fig. 7, a and b, represents a relatively well-preserved cephalo-thorax of a Eurypterid, about 50 mm. in width. A somewhat larger cephalo-thorax occurred in the quartzite close to the one figured, and about 65 mm. in width. Fig. 7 b gives a cross section of this carapace, showing its concavo-convex character. What appear to be the eye-spots are faintly marked, and seem to have been elliptical and nearly centrally situated in the carapace. Possible traces of antennae are present. To the right of the carapace is the faint trace of a limb to which was attached the form. Fig. 7 c, a fin-like swimming appendage. One can only guess at the original shape of this latter, as it is much distorted. The telson, fig. 9, probably belonged to this form. Locality and horizon, Tea Tree Gully, quartzite underlying (?) the Lower Torrens limestone.

Fig. 8 is a drawing of a distorted Eurypterid carapace. The width of this cephalothorax in the drawing is placed vertically. The total width of the carapace, before distortion, was about 60 mm. Two eye-spots are discernible, the right eye clearly defined, the left one faintly outlined. The eye, which is elliptical, measures 5 mm. by 3·5 mm. Locality and horizon, Devil's Elbow, "Blue Metal" limestone.

Fig. 9 is a drawing of a telson, probably belonging to the Eurypterid shown in fig. 7 of this plate. It is 25 mm. in width and 11 mm. in length. As stated on p. 203 of this paper, it much resembles the telson of a *Pterygotus* figured from the Silurian rocks of Maryland, U.S.A.

Fig. 10, a and b, represent, respectively, a photograph and a drawing of a hitherto unclassified organism from near Argyle Downs, in the Kimberley region of Western Australia. The horizon from which it came is either Nullagine or, perhaps—and this seems more probable—Lower Cambrian. It occurs in an oolitic limestone. It is a question whether this is a complete animal in itself, or only a portion of a larger animal. The author inclines to the former view, seeing that he found a form almost identical in the Tapley's Hill shales of the Adelaide Series, by dissolving the shale in hydrofluoric acid. The affinities of this form are quite unknown. Length, about 10 mm. Locality and horizon, Argyle Downs, Western Australia. Lipalian or Lower Cambrian.

PRELIMINARY NOTES ON NEW EVIDENCE AS TO THE AGE OF FORMATIONS ON THE NORTH COAST OF KANGAROO ISLAND.

By C. T. Madigan, M.A., B.Sc.

[Read September 13, 1928.]

Plates XIX. and XX.

During August, 1928, a students' geological excursion, which was productive of some important results, was conducted to Kangaroo Island. It has opened up a new field of investigation for organic remains, and throws new light on the age of formations on the north coast of the island, which may have far-reaching effects on the stratigraphy of the mainland.

The author spent an afternoon investigating the western side of Emu Bay as far as Cape D'Estaing, and the whole party traversed the coast from Cape D'Estaing to the centre of Smith's Bay to the west, on a day on which rain fell continuously. Another day was spent at Smith's, or Freestone Creek, which runs into Smith's Bay on the western side, and Cape Cassini was visited on the same day still further west.

The coastal formations from Point Marsden, the most northerly cape of the island, on the west side of Nepean Bay, to Stokes Bay, in the centre of the northern coast, a distance of some 25 miles, and extending inland for distances up to 3 miles, are marked on the geological sketch maps of Kangaroo Island published with Bulletin No. 4 of the Geological Survey of South Australia as (?) Cambrian, and on the new Geological Map of South Australia, published 1928, as Upper Pre-Cambrian, on the then existing evidence. These formations have been reported on by the late Mr. H. Y. L. Brown (1) and Prof. W. Howchin (2). They may be referred to as the Point Marsden series, from the name of the point where they first appear. Brown describes the series as consisting of sandstone and micaceous sandstone with beds of sandy shale and conglomerate, the conglomerate being the most striking feature, containing, as it does, more or less waterworn pieces of a great variety of rocks. Howchin visited Point Marsden and Smith's Bay soon after Brown, and examined the beds in more detail, paying special attention to the breccia, as he described the conglomerate of Brown. He found the beds at Point Marsden to consist of seven breccia bands up to 6 feet wide separated by sandstone beds of similar dimensions, with overlying sandstone of unknown thickness, and thick sandstone and shales below. He suggests a glacial origin for the breccia beds, but gives good reasons why they must be much older than the overlying Permo-Carboniferous glacial beds of the vicinity. He noted limestone boulders in the beds, and their resemblance to Cambrian marbles on the mainland, though no fossils were detected.

The author has not yet visited Point Marsden or any part of the coast east of Emu Bay. In the centre of Emu Bay there is a sandy beach with no outcrops. The first rock is seen at sea level at the jetty on the west side of the bay. Here it is a reddish quartzite, striking N. 10° E. and dipping 22° E.

The author, with Dr. Wade, (3) prefers to call it a quartzite rather than a sandstone. It yields to the corrosive action of the sea rather readily in some places, though it is more resistant in others. At Cape Cassini some remarkable honeycomb structure was seen in it.

At the jetty, Emu Bay, the bedding planes may be easily recognised, and current bedding is evident. Flakes of mica are plentiful; in fact, the whole series is characterised by abundant muscovite. Pebbles of orthoclase are fairly abundant, and a few pebbles of granitic rock were noted in the hand specimen.

also some pink marble. Two thin sections were made of the quartzite from this locality, with the surprising result that it was found to be an arkose, with fully 50 per cent. of felspar. This explains the pitted nature of the surfaces exposed to the sea, and the honeycomb weathering. The redness is mainly due to the colour of the orthoclase, which forms a good half of the rock. The smaller felspars show but slight rounding, and larger pieces are cleavage pieces practically unworn. Orthoclase is dominant, but microcline and an acid plagioclase also appear. The quartz shows the true characteristics of a quartzite. There are no rounded grains. The grains have been enlarged by secondary deposition to make the quartz interstitial, enclosing the unaffected felspar. Muscovite, much flexed, is fairly abundant. There are scattered grains of magnetite (ilmenite ?) and haematite, and a fair amount of secondary interstitial iron oxides. The rock is described in this detail to indicate its stage of metamorphism, and for comparison with the arkose and other red beds of Marino, with which there is a strong resemblance.

A specimen from a coarser band some hundred feet lower in the series was also sectioned. This rock was much darker in appearance, and contained fairly abundant magnetite (ilmenite ?). Orthoclase was subordinate, the rock consisting mainly of quartz grains, showing secondary enlargement, cemented in a calcareous matrix. Calcite formed at least 30 per cent. of the rock. This bed is nearer the conglomerate described below, which is rich in limestone boulders. The quartzes were all cracked to a remarkable degree, producing a tessellated effect most noticeable on the first glance at the slide. The quartzes also show undulose extinction. Iron as a decomposition product was subordinate. Contorted muscovite was also present, and orthoclase, microcline, and plagioclase in fair abundance. Some of the orthoclases appeared quite large in the hand specimen. Again, the mineral grains were very angular.

From the jetty to Cape D'Estaing the coast is low, with the Point Marsden series appearing only at sea level, being overlain inland by Permo-Carboniferous glacial material, or outwash from it, at the centre of the bay, and sand dunes towards the cape, with a travertine crust on the higher ground behind the sand. Coastal cliffs rise rapidly from Cape D'Estaing south-westerly, along the eastern side of Smith's Bay, to fall away again as the centre of Smith's Bay is reached. This high land is composed of the Point Marsden series, and the surface is a mass of travertine boulders from the crust below. No exposures are seen anywhere except on the beach and in the cliffs.

Proceeding from the Emu Bay jetty to Cape D'Estaing, the strike of the rocks swings round from east of north to due west, the dip being nowhere more than 30°, and changing with the strike from east to north. From the jetty to the first little point, half-way to Cape D'Estaing, the coast is only at a small angle to the strike of the outcrops, but one is gradually descending in the series. The quartzite is seen to contain occasional larger pebbles of granitic rock and felspars, and also thin pieces of slate in places.

On rounding the first point where quartzite is strongly developed, in the next little bay the quartzite is seen to give way to an arenaceous flagstone, coarsely cleavable, some 20 feet thick, of a dark colour, but bright yellow on the bedding planes along which the rock splits. These yellow faces were noticed to be covered with small nodular masses of the size of a pea. The flagstone was interbedded in the quartzite.

As Cape D'Estaing is approached, beach boulders of coarse conglomerate become more numerous, and right at the point itself, a conglomerate is met with in the red quartzite, striking east and west and dipping 30° to the north. This bed is 30 feet thick at its widest part. It is a phase of the quartzite, in which it is embedded, and is seen to thin out and make again along its strike. It is at sea level, parallel to the coast at the cape, and disappearing beneath the sea on the

west side of the cape. The total length of outcrop is about 300 yards. One had no sooner located the conglomerate and suggested examining the boulders when Mr. R. G. Thomas, B.Sc., called out that he had found Archaeocyathinae. Mr. W. Ham also found the fossils in another part independently. It was soon apparent to all that this conglomerate was thickly studded with large boulders of Archaeocyathinae limestone, some as large as 3 feet in diameter. Pl. xvii., fig. 1, shows the outcrop, with Mr. Thomas standing over a large boulder. The action of the sea had etched the exposed blocks of limestone in a most perfect manner so that they could be seen from a standing position to be crowded with the fossils, standing out in beautiful relief. They make better specimens of the formation than any the author has seen from the original beds. The importance of this discovery is obvious. It not only indicates the proximity of the Archaeocyathinae limestone, of Middle (?) Cambrian age, but also shows the Point Marsden series to be post-Cambrian, and of an age not hitherto recognised in southern South Australia.

A second overlying conglomerate was seen standing out of the water about 50 yards from the first, or 70 feet stratigraphically above it. This could not be reached, nor the boulders recognised. The waves are seen breaking on it in the plate.

The formation is called a conglomerate, though the larger blocks are distinctly angular. The smaller pebbles show evidences of water action. The conglomerate is overlain by hundreds of feet of quartzite, in which are included thin shales and limestones to be described later, and underlain also by quartzites of a thickness so far undetermined. As Howchin pointed out at Point Marsden, the conglomerate beds included in the quartzite vary in thickness, and are lenticular in shape. This is typical of the deposits of torrential streams in piedmont areas, where continuity of beds and rounding of boulders is extremely limited. Howchin tentatively suggested a glacial origin for the conglomerates, on account of the variety and angularity of the boulders, but he notes the absence of very large erratics. The angularity of the boulders is not too great for stream-carried *débris,* particularly for boulders of the first generation.

The author considers the quartzite with its included lenticular boulder beds to be of shallow water or even terrestrial origin, derived by torrential streams from neighbouring highlands. These highlands were composed of Cambrian and Pre-Cambrian rocks, which furnished the boulders of Archaeocyathinae limestone and the slate and schist fragments and pebbles of gneissic and granitic rock. A torrential stream a few miles long flowing across the Willunga scarp could furnish the materials of exactly such a conglomerate. Other large boulders associated with the Archaeocyathinae limestone were not conspicuous, the latter being predominant. Granite and jasperous pebbles were noted, but a fine-grained bright red crystalline rock was most frequent. In the hand specimen this was taken to be a porphyrite, but a thin section unexpectedly revealed it as a ferruginous marble, which responded readily to a drop of acid when this was applied to the rock. It was a most interesting section. The structure is granulitic, consisting of rhomb-shaped grains of calcite completely interlocked. The calcite is dusty with finely divided haematite, making the slide red by reflected light, with the exception of scattered clear areas. These clear patches are very irregular in outline, bounded by straight lines, the edges of the reddish calcite crystals, and interstitial between them. The patches are of clear calcite in optical continuity, evidently recrystallized, and having thrown out the iron, which is collected round the borders, defining the areas by comparatively thick dark lines. The original sedimentary nature of the rock is shown by scattered grains of quartz, which are well rounded and for the most part larger than the calcite crystals. There are a few felspar grains. The rock is probably from the pink marble known to be associated with the Archaeocyathinae marble.

From Cape D'Estaing to Smith's Bay the coastal cliffs are high and precipitous, rising to about 200 feet. On leaving the cape, the dip flattens out and the beds become horizontal in Section H, Hundred of Menzies. Beyond this there is a gentle dip westerly as the centre of Smith's Bay is approached. In the centre of the bay the cliffs have receded and the low land is covered with Permo-carboniferous resorted material.

The high cliffs are mainly of red micaceous and calcareous quartzite, which overlies the conglomerate bed. The flagstone seen in Emu Bay reappears high up in the cliffs, and a purple shale bed varying from 10 feet to 1 foot in thickness occurs near sea level. These beds were examined in more detail later, in Freestone Creek. Along the shore were huge black boulders apparently fallen from the cliffs, of impure banded limestone, whose sides were all serrated by differential weathering. These suggested the "mottled limestone" associated with the Archaeocyathinae limestone, as seen on the beach at Myponga Jetty (4), but as an impure limestone was later found in the upper beds of the Point Marsden series, in Freestone Creek, their origin must have been from the cliffs above.

The other locality in which the series was studied in some detail was at Smith's, or Freestone Creek. This creek, by half a dozen little tributaries, carries the run off from the north-western corner of the Hundred of Menzies into the western side of Smith's Bay. The most interesting outcrops are seen in the neighbourhood of the bridge over which the main Cape Borda road passes. The creek furnishes a good section of the upper part of the series.

On the upstream side of the bridge, where the two main tributaries meet, is a cliff about 25 feet high, running parallel to the strike, which is N. 30° E. The beds are here an arenaceous shale or flag, dipping into the cliff at an angle of 9°. They are the same as the flags seen in Emu Bay. They show beautifully preserved ripple marks and sun cracks on the bedding plane partings. As sandy and muddy layers alternate, the conditions were ideal for the preservation of any markings on the mud surfaces, some of which were pitted all over with what appeared to be rain-drop imprints. These little pits are from one-tenth to one-twentieth of an inch across, and almost in contact. They average about 45 to the square inch. They are better seen in most cases as little blobs the size of shot on the underside of the overlying sandy layer. The appearance of the slabs is shown in pl. xviii. The bands showing this phenomenon are about half an inch thick, and it was noted that there were pits on one side of the slab and projections on the other. A thin section unexpectedly disclosed that the depressions went right through the half-inch slabs, and that a pit on one side was connected with a projection on the other. It was noted in the field that the pits were on the upper side of the slabs *in situ*. The thin section of the half-inch slab shows it to be composed of very fine material in bands of varying fineness, as many as six bands being definable. The section is marked by vertical lines, the cores of each pit, in the form of conical depressions at each surface between the bands, down which the material of the band above has sunk into that below in a long tapering cone. This appears to be a most unusual structure, which will be further investigated. The material is of the usual character of fine sediments, quartz grains, mica flakes, other minerals in small amount, iron and unresolvable material. The upward path of air bubbles in muds is suggested, but material has been carried from each layer downwards, and also the pits are so numerous and uniform in size and spacing.

In addition to the sun cracks, ripple marks and so-called rain prints, there are other markings on the slabs suggesting worm casts, occurring in little heaps, and tracks of crustaceans. These will be further investigated when more specimens are collected. The flags are highly micaceous, and the deposits estuarine in character. It is remarkable that no true fossils were found, though twenty-four people were searching.

Proceeding upstream, across the strike, the outcrops are disappointing, as the creek bottom is broad and the valley slopes gentle and soil covered, with few

exposures. Buff quartzite overlies the shale, with a thin bed of impure limestone seen in a couple of small excavations, followed by red micaceous sandstone. Seven hundred yards above the flagstone cliff, at the bend in the creek in the middle of section, 126 N., and on the eastern side of the creek, greenish quartzose hornfels outcrops from beneath the Permo-carboniferous glacial deposits to the east. It dips at a fairly steep angle to the south-west and appears to be the older Pre-Cambrian rock of the island, generally considered to be Archaeozoic. The actual contact of the two series is here obscured. The older rock is actually at a higher level than the Point Marsden series, suggesting a downward faulting of the latter.

From the bridge, downstream, to the sea, the creek winds between steep cliffs of red quartzite and slopes covered with boulders of the same rock. The dip is everywhere from 9° to 11° S.E. At the first bend in the creek, a few hundred yards below the bridge, is seen the only notable variation in the quartzite, namely, a bed of chocolate shale, 20 feet thick, forming a small cliff, overlain by the quartzite. This appears to be the same chocolate shale as seen on the east side of Smith's Bay. Examination of this shale showed that on the bedding planes could be seen many tracks and markings, undoubtedly the trails of animal life crawling on the mud. The most frequent trails are pairs of rows of equally spaced, small, sharply defined nicks obliquely inclined to the general direction, as if made by the appendages or claws of crustaceans. The trails vary in size, and are exactly similar to some of the imprints described and figured by Walcott (5) as trails of trilobites. Nothing similar has so far been observed in South Australian formations. One such track is shown in pl. xvii., fig. 3.

Further search of the beds will be made in the hope of finding remains of the animals themselves before further description of the markings is attempted. The coarse conglomerate should underlie the beds described and may appear in the coastal cliff section to the north of this point. The creek here trends north-east, along the strike of the beds, to the sea.

The only other exposure of the beds examined was at Cape Cassini, seven miles further westward. Once the creek is left, the Cape Borda road runs over level highlands covered with lateritic gravel.

Cape Cassini is about in the middle of the supposed extent along the coast of the Point Marsden series. The plateau is 620 feet above the sea at the Cape. After a steep descent, a low triangular flat, some half-mile across, leads out to the Cape. The descent is covered with red quartzite boulders, and a small creek followed down was full of them. Only one bar of quartzite *in situ* was noted on the way down, so that no section was obtained. This bar showed a dip of 25° S.W. At the coast, the beds dip 10° in a direction E. 30° N., where the creek enters the sea, but a few hundred yards to the east they become perfectly horizontal. Here they show a vertical tessellated jointing, the joints in some places having been filled with iron oxides which have resisted the action of the sea and stand up like walls round miniature fields. In other cases the joints have weathered out, as shown in pl. xvii., fig. 2. To the westward some remarkable honeycomb weathering was seen in the quartzite near sea level.

The existence of this low triangular platform in front of the cliffs at Cape Cassini was not easy to explain. The cliffs may here represent a fault, or the flat may be a remnant of a coastal platform caused by the recent elevation of the coastline of 15 feet or so, which has been noted by Howchin and others, from raised shell beds, and of which there is abundant evidence.

The height of the cliffs at Cape Cassini indicates a thickness of at least 500 feet for the Point Marsden series.

The accompanying sketch section across the beds at Freestone Creek shows the order of succession. The conglomerates were not seen in the section, nor was the contact of the Point Marsden series with the older rock.

The series is thus seen to consist mainly of a red micaceous sandstone of at least 500 feet thickness, including boulder beds near the base, and thin shales and impure limestone higher up.

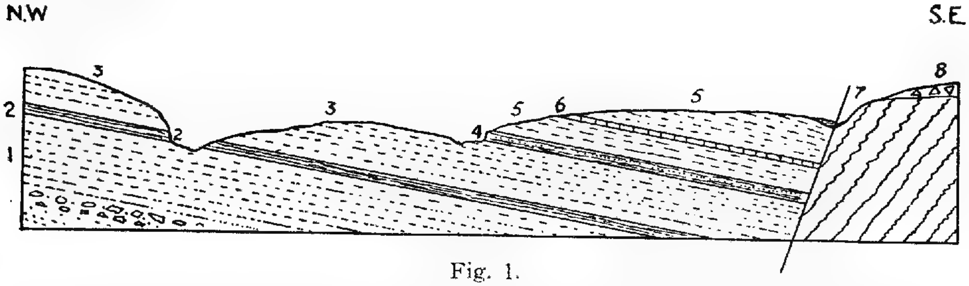

Fig. 1.

Sketch section of the Point Marsden series at Freestone Creek.

Bed 1, red felspathic and micaceous quartzite, at least 200 feet, including con glomerate bed; 2, purple shale, 20 feet; 3, red quartzite, 200 feet; 4, micaceous flags, 25 feet; 5, pink quartzite; 6, thin impure limestone; 7, greenish hornfels; 8, Permo-carboniferous glacial deposits.

The lower red quartzites with pebble beds and conglomerates indicate terrestrial or lacustrine conditions, the higher shales are distinctly shallow water, perhaps estuarine, and the limestones possibly marine. Thin sections of the limestone showed no indication of organic remains. It was very fine grained, showing calcareous mud without any recrystallization, larger quartz grains, mica flakes, and other minerals. No organic remains such as sponge spicules or protozoa were seen.

The series is suggestive of the old red sandstone of the British Isles, with its sandstones and subordinate layers of sandy shale and concretionary limestone. The old red sandstone varies in fineness from close-grained fissile flagstone to thick beds of coarse conglomerate.

As to the age of the Point Marsden series, there is still room for much speculation. Containing, as it does, boulders of well-consolidated Archaeocyathinae limestone, indistinguishable from specimens from the original beds, a Post-Cambrian age is certain. The beds dip at gentle angles only, and the stage of metamorphism indicates burial to no great depth.

The most likely age, from our present knowledge, is Ordovician. This age was suggested for the series by H. Y. L. Brown in the "Record of The Mines of South Australia, 1908." He compares the non-fossiliferous quartzites, sandstones, shales, and conglomerates of Kangaroo Island, near Port Augusta, and on the west side of Lake Torrens with the fossiliferous Ordovician rocks found south of the Macdonnell Ranges (Larapintine). The area west of Take Torrens and several patches on the east side of Eyre Peninsula are coloured Ordovician on the latest geological map of South Australia previously referred to.

Howchin (2) supplies evidence of unconformity with the overlying Permo-carboniferous deposits. This was not seen by the author.

The fundamental rocks of Kangaroo Island are a continuation, by the swing of the strike, of the formations of the Fleurieu Peninsula on the mainland. In a map of this area by the author (6), a thin limestone, the Delamere marble, is shown entering the sea opposite the east end of the island. The continuation of this was observed by Brown (1) on the island coast in exactly the correct spot, the Manganese Mine in Section R, Hundred of Dudley, where he noted a band of "crystalline marble" enclosed in mica schist. To the west of this marble on the mainland occurs the thick Rapid Bay marble. The author suggested in the paper quoted (6) that the Rapid Bay marble was the Archaeocyathinae beds, and the Delamere marble the Brighton limestone. Following the same grain of

country, the Rapid Bay marble should underlie the north coast of the island, and here we find a conglomerate containing large boulders of Archaeocyathinae limestone, indicating the close proximity of the parent beds, a strong point in favour of the argument put forward for the southerly extension of the Archaeocyathinae limestone.

In another paper (7) the author showed how in the section provided by the Willunga scarp, gently dipping (30°) Sturtian tillite overlay, with many intervening beds, the more steeply dipping (60°) Archaeocyathinae limestone, and mentioned with temerity the possibility of this being the correct order of the beds. Howchin, (2) with his great experience of glacial formations, felt strongly inclined to a glacial origin for the Point Marsden conglomerates. If this view is correct, then the Point Marsden conglomerates and the Sturtian tillite may be one. Both are overlain by similar quartzites. The idea is by no means fantastic. In the paper quoted (7), an unconformity below the Sturtian tillite was suggested. This idea would lift at least portion of the Adelaide Series out of the Cambrian altogether, and would explain the absence of this portion from Yorke's Peninsula, where the Archaeocyathinae limestone overlies a grit resting directly on the ancient gneisses.

This account is intended merely to record the observations made, and to indicate the possibilities in their bearing on the local geology.

A good contact between the Point Marsden series and the underlying formations should be found on the coast west of Cape Cassini. This coast has never been examined in detail, nor the westerly extension of the series definitely determined. The author intends to complete the field work at the earliest opportunity.

References.

(1) Report by the Government Geologist, Kangaroo Island, 1898.

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(3) Geological Survey of South Australia, Bulletin No. 4. The supposed oil-bearing areas of South Australia. Investigations by Arthur Wade, D.Sc.

(4) Organic Remains from below the Archaeocyathinae Limestone at Myponga Jetty, South Australia, by C. T. Madigan. Trans. Roy. Soc. S. Austr., vol. l., 1926.

(5) Smithsonian Miscellaneous collections, vol. 67, 1924.

(6) The Geology of the Fleurieu Peninsula, Part I. The coast from Sellick's Hill to Victor Harbour, by C. T. Madigan. Trans. Roy. Soc. S. Austr., vol. xlix., 1925.

(7) The Geology of the Willunga Scarp, by C. T. Madigan. Trans. Roy. Soc. S. Austr., vol. li., 1927.

DESCRIPTION OF PLATES XVII. AND XVIII.

Plate XIX.

Fig. 1. Outcrop of conglomerate at Cape D'Estaing. Mr. R. G. Thomas is seen standing over an included boulder of Archaeocyathinae limestone.

Fig. 2. Jointing and weathering in horizontal red felspathic quartzite, Cape Cassini, at sea level.

Fig. 3. Tracks of crustaceans in purple shale of Point Marsden series, half natural size.

Plate XX.

Fig. 1. Curious markings in flagstones in Point Marsden series. Pits in the surface of a slab. Six-sevenths natural size.

Fig. 2. The underneath side of a slab showing small raised mounds. The structure passes right through from top to bottom of half-inch slabs. Six-sevenths natural size.

AUSTRALIAN FUNGI: NOTES AND DESCRIPTIONS.—No. 7.

By J. Burton Cleland, M.D.

[Read October 11, 1928.]

The last paper of this series, No. 6, appeared in these Transactions and Proceedings, vol. li., 1927, pp. 298-306. In this number an attempt is made to define by descriptions and keys some of the South Australian species of the genus *Cortinarius*. As might be expected from the nature of our vegetation, most of the species of this genus seem specifically distinct from those elsewhere. From a mass of material, comprising full notes of the features presented by the fresh plants, the following species have been identified or defined, though probably an equal number of other species have been collected by the author and await disentanglement from their fellows. Consequently the keys given are necessarily provisional, but it is hoped they will form a basis on which additions can be satisfactorily grafted. The species dealt with are given numbers consecutive with those in previous papers. Colour tints when specifically noted in capital letters are based on Ridgway's "Colour Standards and Colour Nomenclature," 1912 edition, references to the plates therein being given.

The South Australian Species of the Genus Cortinarius.

Key to the Species of *Cortinarius*, Section *Phlegmacium*.

Shades of blue present.
- Lavender tints (sometimes absent) on stem only, base usually bulbous but not definitely marginate.
  - Large, up to 3 ins., pileus whitish or pallid with pinkish-buff tints, gills becoming buff or ochraceous-tawny, spores 7·5 to 12×4·5 to 6·5 μ .. *C. (Ph.) lavendulensis*
- Greenish-blue tints more or less evident on the pileus and stem.
  - Yellowish or yellowish-brown tints predominating in the pileus, spores subspherical 8×6, 6·5×5·2, 7 to 9 μ .. .. *C. (Ph.) rotundisporus*
- Faint violet tint in gills when young, stem whitish in Australian plants (tinted with violaceous in British).
  - Very large, up to 9 ins., pileus becoming dark scorched brown, gills pallid brownish-white, tinted with violet, finally dark brown, spores 10·4 to 12×5 μ .. .. *C. (Ph.) largus*

Plants brown or yellow-brown, no blue.
- Medium-sized, 1½ to 3 ins., pileus dark brown, gills near raw sienna, stem yellowish and brownish tinted, spores 8·5 to 10·4×5·5 to 7 μ .. .. *C. (Ph.) castaneo-fulvus*
- Large, up to 4½ ins., pileus, gills and stem ochraceous-tawny, spores 9×5·5 μ .. .. *C. (Ph.) sublargus*

484. *Cortinarius (Phlegmacium) lavendulensis*, n. sp.—Pileus 2½ to 3½ ins. (6·2 to 8·7 cm.), glutinous, irregularly convex, finally somewhat upturned, pallid with stone-coloured to brownish tints. Gills slightly sinuate, moderately close, up to ⅜ in. (10 mm.) deep, when young paler than Wood Brown (xl.) with a slight violet tint, then Sayal Brown (xxix.), then more tawny near Antique Brown (iii.). Stem 2 to 3 ins. (5 to 7·5 cm.) high, moderately stout to stout (½ to ¾ in., 1·2 to 1·8 cm., thick), base usually bulbous (up to 1 to 1½ in., 2·5 to 3·7 cm.), fibrillose, solid, whitish with tints of Pale Bluish Lavender (xxxvi.), pallid below, with a broad subcentral zone of brownish fibrils from the veil. Flesh slightly

lilac-tinted in the stem. Smell slight. Spores oblique, one end more pointed, yellow-brown, 11 to 12×6 to 6·5 μ. Under bushes. S.A.—Mt. Lofty, July, 1928.

Specimens, all apparently belonging to this species, vary somewhat. The pileus may be only 1¼ in. (3·2 cm.) in diameter, and may be a little rugose-rivulose. It may be pure white with tints of Pinkish Buff (xxix.) becoming darker and more scorched looking (Mt. Lofty, July, 1928). The gills at first may be very pale buff, then Pinkish Buff to Cinnamon Buff (xxix.) and Ochraceous Buff (xv.) or Ochraceous Tawny (xv.). The stem may be rather slender, its bulb may be absent or have a slightly raised edge, it is occasionally hollow and it may lack an obvious lilac or lavender tint or show this only faintly. The veil is whitish or remnants on the stem may appear brownish. The flesh of the pileus is thick over the disc, thin and equally attenuated outwards. It may be white or have a trace of buff or be slightly yellowish or in places watery-greyish. The lilac tint in the flesh of the stem may not be noticeable and there was a greenish tint lining a hollow in one stem. The spores vary from 7·5 to 9×4·5 to 5 μ (Kuitpo, June, 1928, Miss Buxton, Watercolour No. 20—lavender tints not noticeable on the stem) to the figures given. Dried specimens have pallid or scorched-looking pilei with bright ochraceous-tawny gills. The species has also been collected at Mt. Lofty in April and August.

485. (I., 1918, No. 13.) *Cortinarius (Phlegmacium) rotundisporus*, Clel. et Cheel.—This species is probably correctly referred to the section *Phlegmacium*, though the stickiness of the pileus is not great and most collections have been made when this has disappeared. The pileus may reach 2½ ins. (6·2 cm.), may be gibbous or depressed in the centre and may be somewhat squamulose becoming rimosely cracked and with the edge lacerated. The predominating colour is yellowish or yellowish-brown or sometimes brownish [near Honey Yellow (xxx.) in the centre to Cream Buff (xxx.) at the periphery, or Mustard Yellow (xvi.) to Buff Yellow (iv.) or Deep Colonial Buff (xxx.) or Isabella Colour (xxx.).] This ground colour is streaked or tinted with blue or greenish-blue [Burn Blue (xxxiv.) or Greenish Glaucous Blue (xlii.) or Ramier Blue (xliii.) or near Gnaphalium Green (xlvii.)]. The gills may vary from deeply sinuate to emarginately adnexed and sometimes even adnate. They are pallid when young becoming Isabella Colour (xxx.), Tawny Olive (xxix.), Sayal Brown (xxix.), or Snuff Brown (xxix.). A slight violet tint has been noticed occasionally when young. The stem may reach 3 ins. (7·5 cm.), may be slightly swollen at the base, and is yellowish tinted with the blue of the pileus. The yellowish flesh sometimes has lilac or violet tints. The spores are pear-shaped subspherical, smooth or slightly rough, 6·5 to 9×5·5 to 6·2 μ, 6 to 9 μ, or in the Kuitpo specimens 9·5 to occasionally 10·5×6·5 μ. S.A.—Mt. Lofty, April, June, July, Aug.; National Park, Aug.; Kuitpo, March.

Cortinarius (Phlegmacium) largus, Fr.—*Vide* this series, I., 1918, No. 12.

486. *Cortinarius (Phlegmacium ?) castaneo-fulvus*, n. sp.—Pileus 2 ins. (5 cm.), convex, a little irregular, substriate, sticky when moist, rich dark brown near Argus Brown (iii.) and Chestnut Brown (xiv.). Gills adnate, moderately close, edges slightly serrate, near Raw Sienna (iii.). Stem up to 3 ins. long, moderately slender to moderately stout, fibrillose, hollow, tinted with yellowish and brown, with brownish threads of the veil. Flesh yellowish. Spores elliptical, yellow-brown, 8·5×5·5, 9 to 10×6·5 to 7 μ. In the dry specimens, the very dark nearly black pileus and stem contrast with the yellow-brown (near Sudan Brown or Brussels Brown, iii.) gills. S.A.—Mt. Lofty, June, 1928.

The species seems best referred to *Phlegmacium*, though the stickiness seems evanescent and was frequently not noted. There is, as usual, considerable variation in collections apparently all of the same species. The pileus may vary from 1½ to 3 ins. (3·7 to 7·5 cm.) and may be deeply and irregularly convex, with a

large boss so as to be almost conical, or it may be gibbous or repand; its edge may be furrowed or lacerated; it may be innately silky-fibrillose or minutely tomentose; in colour it may be Mars Brown (xv.) [Stirling West, July, 1927] or Cinnamon Brown (xv.) [Mount Lofty, August], Chestnut to yellow-chestnut or dark chestnut, or Russet (xv.) [Belair, July, 1928, Miss Buxton, Watercolour No. 22]. The gills may be slightly sinuate, are usually finely serrate or sometimes crenulate, and may be Cinnamon Brown (xv.), Ochraceous Tawny (xv.), golden-yellow or yellow-brown, and when dry near Mummy Brown (xv.). The stem may be only 1½ ins. (3·7 cm.) high, may be flattened above and attenuated below, and may be pallid yellowish. The flesh is thin, attenuated outwards, and may be pale reddish-brown, and may have a dark line along the gill attachment and under the crust. The spores often appear slightly rough, may approach subspherical in form, and vary from 7·5 to 10·4×5·5 to 7 μ. Also collected at Mt. Lofty in July.

487. *Cortinarius (Phlegmacium) sublargus,* n. sp.—Pileus up to 4½ ins. (11·2 cm.), slightly convex to nearly plane or with the centre depressed, slightly sticky, subfibrillose, near Ochraceous Tawny (xv.) or darker. Gills slightly sinuate, moderately close, up to ½ in. (1·2 cm.) deep, near Ochraceous Tawny. Stem up to 3 ins. (7·5 cm.) high, stout (1 in., 2·5 cm., thick), fibrillose, solid, more or less ochraceous-tawny or yellowish. Flesh of pileus soapy-yellow, of the stem yellowish. Spores oblique, yellow-brown, 9×5·5 μ. S.A.—Mt. Lofty, June, 1928.

Key to the Species of *Cortinarius,* Section *Myxamicium.*

Plants red.	
Pileus and stem dragon's blood-red becoming rufous, gills tawny-olive, spores 9·5×6·5 μ	*C. (M.) ruber*
Plants yellow-brown.	
Pileus ochraceous-tawny, gills pallid cinnamon becoming tawny-olive, stem stout, spores 13 to 15×7·5 μ	*C. (M.) subarvinaceus*
Pileus yellow-ochre, gills sudan brown, stem somewhat bulbous, spores 8·5×4 μ	*C. (M.) ochraceus*
Plants with violet or lilac tints.	
Large up to 5 ins., pileus violet becoming brown, gills earthy with a violet tint becoming brown, stem pallid with a violet tint, spores 12 to 14·5×7 to 7·5 μ	*C. (M.) Archeri*
Large up to 3½ ins., pileus violet becoming brownish, gills pinkish-cinnamon and violet tinted, stem violet, spores smaller, 9 to 10×4·5 to 5·5 μ ..	*C. (M.) subarcheri*

Cortinarius (Myxamicium) ruber. Vide this series, VI., 1927, No. 474.

488. (VI., 1927, No. 475.) *Cortinarius (Myxamicium) subarvinaceus,* Clel.—Further specimens have been collected at Mt. Lofty, March and April, and Encounter Bay, May. The pileus may reach 4½ ins. (11·2 cm.) in size and may be Amber Brown (iii.) to yellow-brown. Some Mt. Lofty plants show a bulbous base to the stem with a rim, others lack this. The stem may also be rather slender and may become hollow. The gills were adnate and their sides rugose in the Encounter Bay specimens. The March Mt. Lofty specimens had spores of 10 to 13×5·6 to 7 μ, the April ones 13 to 17×8·8 μ.

489. (VI., 1927, No. 476.) *Cortinarius (Myxamicium) ochraceus,* Clel.—Further collections from Mt. Lofty, June, show that the pileus, gills, and stem may be Yellow Ochre (xv.), or the pileus Ochraceous Tawny (xv.), the gills near Sudan Brown (iii.). The pileus may reach 3½ ins. (8·7 cm.) and the stem 2½ ins. (6·2 cm.). The pileus may be slightly rugoso-striate and the stem may be fibrillose and tend to be hollow. Spores 8·5 to 9·5×4·5 to 5 μ. Specimens collected at Mt. Lofty in April, 1924, have the pileus near Cinnamon and Sayal Brown (xxix.), the gills Ochraceous Tawny (xv.), the stem similarly tinted, the

pileus pilose, the gills sinuate, ventricose and rather deep, spores 7·5×4·2 μ. Kinchina specimens July, 1923, apparently this species, have the pileus browner than Citrine Drab (xl.), the stem with tints of the same, the gills near Buff Brown (xl.) when young, spores 8×5 μ.

490. (I., 1918, No. 14.) *Cortinarius (Myxamicium) Archeri,* Berk.—S.A.—Mt. Lofty, May, June, July.

491. *Cortinarius (Myxamicium) subarcheri,* n. sp.—Pileus up to $3\frac{1}{2}$ ins. (8·7 cm.), convex, sometimes irregular, viscid, violet, becoming pale brownish above or brownish-violet to brown or pallid lavender. Gills sinuate, slightly toothed, moderately close, Pinkish Cinnamon (xxix.) tinged with violet or violet becoming Vinaceous Fawn (xl.). Stem $1\frac{1}{2}$ ins. (3·7 cm.) high, becoming more elongated, at first thick (up to $1\frac{1}{2}$ ins., 3·7 cm.) downy fibrillose, violet tinted or Pale Lobelia Violet (xxxviii.), mycelial mass at the base. Flesh with violet-lilac tints. Spores yellow-brown, obliquely elliptical, 9 to 10×4·5 to 5·5 μ. S.A.—Bundaleer State Forest, June, 1928; in *Eucalyptus Baxteri* forest, Mt. Burr Forest Reserve, May, 1928. The same species was probably also collected at Kinchina, July, 1923, spores almost mummy-shaped, narrow, 8·5 to 9·5×5 μ.

Key to the Species of *Cortinarius,* Section *Dermocybe.*

Gills bright cinnamon, red or yellow.	
Whole plant near dark blood-red, medium-sized, spores 6·5 to 9·5×4·8 to 7·2 μ	*C. (D.) sanguineus*
Pileus large, dark green, gills yellow at first, stem yellowish, spores 8 to 13×5 to 6·5 μ	*C. (D.) austro-venetus*
Pileus large, dark brown, gills when young yellowish becoming buckthorn brown, stem yellowish, spores 9 to 11×5 to 7·5 μ	*C. (D.) subcinnamoneus*

492. *Cortinarius (Dermocybe) sanguineus,* (Wulf.) Fr.—Pileus up to $1\frac{1}{4}$ ins. (3 cm.) or more, broadly conical to conico-convex, then convex, obtuse or gibbous, innately fibrillose, the edge sometimes slightly sulcate, or silky shining to coarsely rugose, dark blood-red [browner than Morocco Red (i.), near Morocco Red with the centre Claret Brown (i.), or near Brazil Red (i.)]. Gills adnate to adnato-adnexed or slightly sinuate, moderately close to crowded, dark red becoming rusty-red [near Burnt Sienna (ii.), becoming Sanford's Brown (ii.), near Morocco Red or Brazil Red.] Stem 2 to $3\frac{1}{2}$ ins. (5 to 8·7 cm.) high, moderately stout to rather slender, swollen below or nearly equal, fibrillose, slightly hollow, blood-red (near Burnt Sienna, tinged with Morocco Red), paler above. Veil fugacious, arachnoid, reddish. Flesh thickish below the umbo, thin externally, pallid reddish or slightly yellowish-red, not exuding a juice when pressed. Spores elliptical, pear-shaped or rather rotund, oblique, sometimes slightly rough, yellow-brown, 6·5 to 9·5×4·8 to 7·2 μ. S.A.—Mt. Lofty, June and July; National Park, August (Jeffrey, photo. No. 1; photo. No. 34).

Our plants seem to differ from British ones in the pileus not being shaggy or squamulose, in the base being sometimes rather swollen and in having no appreciable juice.

493. *Cortinarius (D.) austro-venetus,* n. sp.—Pileus up to 3 ins. (7·5 cm.), convex, then nearly plane, more or less gibbous, with subinnate villous down, dark green [near Olive Citrine (xvi.)], darker in the centre. Gills adnate, close, Olive Ochre (xxx.). Stem up to 3 ins. (7·5 cm.) high, rather stout (up to $\frac{1}{2}$ in., 1-2 cm.) below to slender, slightly attenuated upwards, fibrillose, hollow, pallid tinged with the colour of the gills. Flesh thick over the disc, very attenuated towards the edge. Veil fugacious. Spores oblique, dull brown, 9·5 to 13×5·5 to 6·5, sometimes 8×5 μ. S.A.—Mt. Lofty, June, July; National Park, August.

494. *Cortinarius (Dermocybe) subcinnamoneus,* n. sp.—Pileus up to $2\frac{1}{2}$ ins. (6·2 cm.), convex, gibbous, then expanding, sometimes slightly upturned and

wavy, minutely fibrillose, near Snuff Brown (xxix.), passing into Bister (xxix.) in the centre, later Burnt Umber (xxviii.), becoming nearly black in the centre, Saccardo's Umber (xxix.) when young. Gills sinuate, moderately close, $\frac{3}{8}$ in. (10 mm.) deep, when young Mustard Yellow (xvi.), becoming near Buckthorn Brown (xv.). Stem up to 3 ins. (7·5 cm.) high, slender or stout ($\frac{1}{4}$ to $\frac{1}{2}$ in., 6 to 12·5 mm.), slightly bulbous, somewhat fibrillose and striate, markedly hollow, with tints of Naples Yellow (xvi.). Flesh yellowish, heaped up under the umbo, gradually attenuated outwards. Cobweb veil pale yellowish. Spores irregularly elliptical, slightly rough, yellowish-brown, 10·5×6·5 μ. Gregarious. S.A.—Mt. Lofty, June, 1921 (Miss Fiveash, Watercolour No. 16). The whole plant becomes a very dark brown when dried.

Variations noted in other collections comprise the following:—The pileus may be irregularly plane, subsquamulose, near Sudan Brown and Argus Brown (iii.) or near Hazel (xiv.). The gills may be slightly sinuate to adnexed and Sulphine Yellow (iv.) in single plates to Aniline Yellow (iv.) in masses, or Olive Ochre (xxx.) when young, passing to Buckthorn Brown (xv.). The stem may be stout (up to $\frac{3}{4}$ in., 18 mm. above), slightly attenuated downwards and pallid with brownish tints. The spores are oblique, with one end pointed, 9 to 11×5 to 7·5 μ. S.A.—Mt. Lofty, June and July.

We originally referred the species to the European *C. cinnamoneus*, (L.) Fr., to which it seems closely allied, differing in a darker pileus, in the gills being usually definitely though often slightly sinuate, and in the decidedly larger spores (*C. cinnamoneus*, in Rea's British Basidiomycetes, 6 to 8×4 to 5 μ).

Key to the Species of *Cortinarius*, Section *Telamonia*.

Pileus reddish-brown, reddish-cinnamon, russet, etc., when moist, submembranaceous.
- Stem attenuated downwards.
  - Edge of pileus striate when moist, edges of gills whitish and finely serrate, spores 7·5×4 μ .. *C. (T.) striatulus*
  - Pileus not striate and edges of gills not whitish and not serrate, stem white, spores 7·5 to 8·5×4·2 μ *C. (T.) russeo-cinnamoneus*
- Stem not appreciably attenuated downwards.
  - Pileus more or less hoary from whitish fibrils, gills ochraceous-tawny, stem whitish, caespitose, spores 9×4·5 μ .. .. *C. (T.) fibrillosus*

Vinaceous or purplish tints present.
- Pileus vinaceous drab-brown, gills and stem purplish-brown, spores 9×7·5, 7·5×6 μ .. .. .. *C. (T.) vinaceo-cinereus*

495. *Cortinarius (Telamonia) striatulus*, n. sp.—Pileus up to 1 in. (2·5 cm.), somewhat convex to nearly plane, more or less gibbous, wavy on the margin, sometimes slightly repand, very finely fibrillose, submembranaceous, when moist striate at the periphery and between Russet and Cinnamon Brown (xv.), with a pale ring round the edge, when dry paler than Cinnamon Buff (xxix.). Gills sinuate, moderately close, slightly ventricose, near Sayal Brown (xxix.), with narrow finely serrate whitish edges. Stem 2 ins. (5 cm.) high, moderately slender, a little flexuous, sometimes flattened, attenuated at the base and sometimes at the apex as well, fibrillose, markedly hollow, pallid, with a brownish tint above. Flesh pallid with a slight reddish-brown tint. Spores yellow-brown, oblique, 7·5×4 μ, subcaespitose amongst shrubs under Eucalypts. S.A.—Mt. Lofty, July 28, 1928.

496. *Cortinarius (Telamonia) russeo-cinnamoneus*, n. sp.—Pileus $\frac{3}{4}$ to $1\frac{1}{2}$ ins. (1·8 to 3·7 cm.), irregularly convex, then more expanded, edge wavy, sometimes repand, more or less gibbous, very finely fibrillose, submembranaceous, edge slightly inturned when young, when moist Russet (xv.) or Mikado Brown (xxix.), drying to Cinnamon Buff or Clay colour (xxix.). Gills adnato-sinuate

with a slight decurrent tooth, moderately close, ventricose, tawny cinnamon, edges not pallid or serrate. Stem $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. (3·7 to 6·2 cm.) high, moderately slender, attenuated at the base, sometimes flexuous, finely silky-fibrillose, solid, then hollow, white. Flesh of stem pallid reddish-brown. Veil when very young has delicate white fibrils covering the globose pileus and descending to clothe the stem. Spores yellowish-brown, 7·5 to 9×4·2 to 5·5 μ, subcaespitose under Eucalypts. S.A.—Belair, July 28, 1928 (Miss Buxton, Watercolour No. 23); Mt. Lofty, June, 1928 (pileus up to 2 ins., 5 cm., usually finally irregularly upturned, Tawny to Ochraceous Tawny (xv.) when moist, drying paler than Ochraceous Buff (xv.); gills Ochraceous Tawny and darker); National Park, August, 1927.

497. *Cortinarius (Telamonia) fibrillosus*, n. sp.—Pileus 1 to $1\frac{1}{2}$ ins., deeply convex, then convex and gibbous, hoary from whitish mealy fibrils sometimes forming a white edge to the pileus, when moist reddish-brown [near Russet (xv.) or darker], when dry between Cinnamon and Cinnamon Buff (xxix.). Gills adnexed, moderately close, yellower than Ochraceous Tawny (xv.). Stem up to $1\frac{3}{4}$ in. (4·3 cm.) high, slender, fibrillose, pallid whitish, hollow. Flesh reddish, thin. Spores pale brown, oblique, 9×4·5 μ. Caespitose on the ground near stumps. S.A.—Mt. Lofty, June, 1928, and June, 1927.

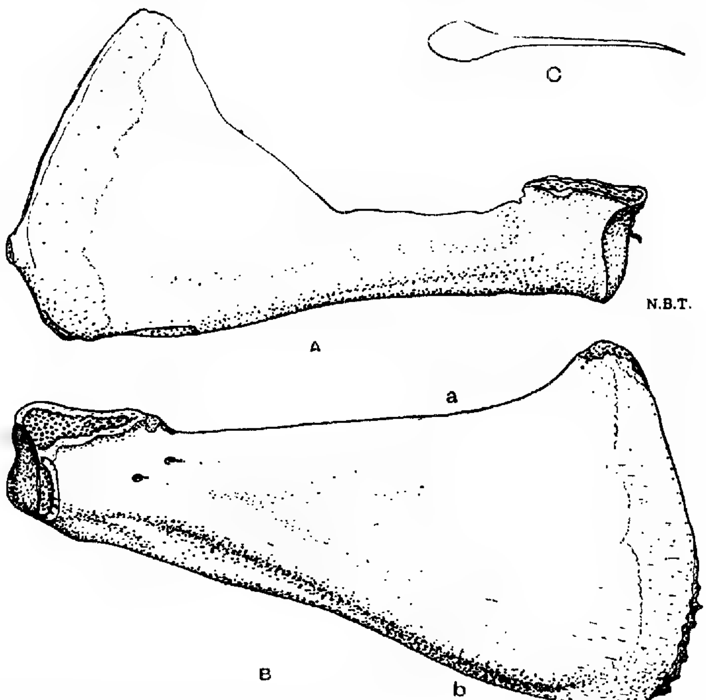
498. *Cortinarius (Telamonia) vinaceo-cinereus*, n. sp.—Pileus 1 in. (2·5 cm.), at first globose, then irregularly convex, minutely fibrillose, slightly rugose, vinaceous drab-brown with paler rim, drying pallid brownish. Gills adnate, slightly ventricose, moderately close, Purple Drab (xlv.) becoming Bay (ii.). Stem up to 1 in. (2·5 cm.), slightly flexuous, moderately slender, fibrillose, colour of the gills then pallid. Universal veil with outer fibres brownish and covering the pileus when young with fine fibres, inner fibres pallid. Spores dull brown, nearly subspherical with one end rounded, the other more acute, 9×7·5, 7·5×6 μ. Single. Belair, July, 1928 (Miss Buxton, Watercolour No. 24).

ETHNOLOGICAL NOTES FROM ARNHEM LAND AND FROM TASMANIA.

By Norman B. Tindale, Ethnologist, S.A. Museum.
(Contribution from the South Australian Museum.)

[Read October 11, 1928.]

During my sojourn in Arnhem Land, North Australia (1921-1922), I obtained several examples of an unusual type of bone implement. These have been on exhibition in the Museum for some years, but have not been described previously. An illustrated account is therefore given herewith. The opportunity



Figs. A-C. Bone knives. C is a diagrammatic cross section of B from a to b.

is taken of also describing a shell necklace, strung by Truganina, the last survivor of the Tasmanian race, who died in May, 1876. This necklace was presented to the Museum by Mrs. W. A. Norman, who received it some years ago from a personal friend of Mr. Robinson. The latter took an active interest in the Tasmanians during their last years.

A. Bone Yam Knives.

In May, 1922, I made a visit to Wagundu, a cave-shelter belonging to the members of the Allawa tribe. I was accompanied by an old Allawa man. The territory of these people is now on the eastern fringe of the "cattle country"; the natives have, in recent years, left their haunts for the superior attractions of the station camps, and now seldom, if ever, visit their old camping places.

Wagundu is situated on Mountain Creek, a tributary of the Roper River, at a point approximately 30 miles south-east from Leichhardt Bar. Its position is marked on a map of eastern Arnhem Land published in a former paper.[1]

A detailed description of the cave and of the remarkable paintings depicted on its walls, and also of the numerous articles discovered in the floor deposits or stored in the cave is in preparation.

Amongst the articles of special interest discovered in the shelter and presented to me by the old Allawa man, were four examples of a peculiar, and apparently undescribed type of cutting implement made of bone. Three of these were buried in the floor and were probably many years old, the fourth was found in a dilly-bag stored on a wooden frame inside the entrance of the shelter.

These bone knives are used by the women for slicing native yams and other food roots. Some of these contain distasteful or acrid principles, which have to be removed. The yams are sliced thinly with the knives and soaked in running water, either in a basket, or in small enclosures made by pinning leaves down with sticks, in the bed of a shallow stream.

The knives are usually made from the shoulder-blades of kangaroos. During manufacture the whole of the spine of the scapula, together with the parts superior to it, are cut off. Thus the inferior costa forms the back of the knife and the remaining part of the neck, including the glenoid cavity, becomes the handle. The cutting edge is formed from the thin bone of the middle of the scapula, which is scraped to a fine edge with a flaked quartzite knife of the usual North Australian pattern. Projecting parts of the margin of the bone are sometimes trimmed off. The three older examples secured, two of which are figured (figs. A-C), show traces of a former gum handle; these examples are made from the bones of a large plain-frequenting kangaroo (*Macropus giganteus* var.). Sometimes the blade is broad, as in fig. B, at others it is much more slender (fig. A) and is hooked somewhat like a modern pruning knife.

The more recent example, mentioned as having been discovered in a dilly-bag, was made from the shoulder-blade of a goat. This bone was probably obtained at Leichhardt Bar, where a small flock of the animals is maintained by the police officer who is stationed there.

Bone yam knives of the types described above are used amongst the peoples of the Allawa and Mara tribes in the Roper River district, and by others (for example, the Ngandi) on the tableland north of the river.

B. A Tasmanian Shell Necklace.

This necklace is 71 cm. in length, but was at one time longer. It is formed of the small shells of *Acmaea marginata*, a species of land-shell found around salt swamps and lagoons near the sea. The shells have been pierced through the outer lip, and threaded upon a doubled strand of fine twine.

The Tasmanian women were evidently very fond of these ornaments, which they frequently wore wound several times around their necks. Nearly every known portraits show them to have been wearing either shell or grass bugle necklaces. The shells depicted, however, are usually representatives of a larger species (probably *Coxiella)* than the ones used in the making of the present example.

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(1) Tindale, Norman B., Rec. S. Austr. Mus., iii., 1925, f. 23.

ADDITIONS TO THE FLORA OF SOUTH AUSTRALIA.
No. 26.

By J. M. Black.

[Read October 11, 1928.]

Cyperaceae.

Schoenus monocarpus, nov. sp. Caules graciles rigidiusculi striati circiter 50 cm. longi; folia ad vaginas basilares brunneas laminis brevibus subulatisque terminatas reducta; panicula angusta laxa 4-8 cm. longa; pedunculi capillares 2-12 mm. longi bini vel terni in axillis bractearum vaginantium laminâ brevi subulatâ terminatarum; spiculae angustissimae 5-8 mm. longae, glumis plerumque emarginatis et mucronatis quarum 5-6 infimis vacuis et sensim brevioribus; flores solitarii vel rarius 2 quorum inferior solus fertilis; stamina 3; nux ovoidea alba leniter 3-costata 1¾ mm. longa; setae hypogynae nullae.

Back Valley, near Encounter Bay, coll. J. B. Cleland. Differs from *S. brachyphyllus* in the slender stems and spikelets, and the solitary fruit; from *S. tenuissimus* in the numerous and shorter spikelets; from both in the absence of hypogynous bristles.

Restionaceae.

Lepyrodia valliculae, nov. sp. Caules filiformes simplices erecti 6-30 cm. alti; rhizoma gracile non repens; vaginae basilares et caulinae appressae 8-12 mm. longae laminis brevibus subulatis terminatae; flores dioici in paniculâ angustâ spiciformi 1-7 cm. longâ dispositi; paniculae rami inferiores interdum 1-2 cm. longi inferne nudi; bracteolae 2 perianthio breviores; segmenta subaequalia acuta 2-3 mm. longa exteriora interiora aequantia vel paulo excedentia feminea quam mascula majora; staminodia et ovaria abortiva nulla; capsula subglobularis 1½ mm. longa.

Back Valley, near Encounter Bay, coll. J. B. Cleland. Differs from *L. Muelleri* in smaller stature, more slender stems, dioecious flowers and shorter bracteoles.

Leguminosae.

Swainsona fissimontana, J. M. Black nov. var. *coarctata.* Variat caulibus erectioribus numerosioribus coarctatis, foliolis tantum 1-2 mm. latis, calycis pilis pallidioribus interdum fere albis, vexillo non longiore quam lato.—Flinders Range (near Hawker).—Western New South Wales (near Mount Koonenberry). Has a different aspect from the type and may be a distinct species, but the specimens are few and incomplete.

Myrtaceae.

Calythrix involucrata, nov. sp. Frutex glaber folia alterna plus minusve patentia lineari-subtrigona 3-4 mm. longa glandulis immersis obsita brevissime petiolata; flores sessiles solitarii vel saepius 2-5 in fasciculum terminalem aggregati et pluribus bracteis scariosis mucronatis carinatis ciliolatis duplo quam folia suprema longioribus involucrati; bracteolae circiter 5 mm. longae recurvo-mucronatae prope basin connatae; receptaculum 7-9 mm. longum, collo cavo paulo longiore quam ovarium; sepala truncata 2 mm. longa, aristis receptaculum aequantibus; petala ovata rosea 5 mm. longa; stamina circiter 20.

Cummins, coll. Miss J. Stopp; Hundreds of Brooker and Yadnarie, collectors unknown; all on Eyre Peninsula.

Differs from *C. tetragona* in the hollow neck of the receptacle and apparently from all other species in the conspicuous involucre of scarious bracts which surrounds the terminal flower-clusters. The bracts are altered leaves, as is shown by the blunt herbaceous mucro and green keel of the outer ones, while the broad scarious ciliolate margins correspond to the narrow scarious ciliolate margins visible on the short petioles of some of the small uppermost leaves.

It appears to me that the genus would be best divided into 2 sections:—1, *Stereotrachylae,* with the neck solid and the style rising from its summit, and 2, *Coelotrachylae,* with the neck hollow, so that the style rises from the ovary and its lower portion remains free and surrounded by the hollow neck.

Borraginaceae.

Plagiobothrys orthostatus, nov. sp. Herbula annua scabro-pubescens, caulibus erectis 4-7 cm. altis; folia linearia 1-3 cm. longa circiter 1 mm. lata radicalia basin versus dilatata; racemi laxi 1-5 cm. longi interrupte bracteati; calyx fructifer 2½ mm. longus, segmentis 5 lanceolatis rectis subaequalibus; corolla alba 2 mm. longa; stamina 5 paulo infra medium tubum affixa; nuculae 4 ovoideo-oblongae subacutae minime 1½ mm. longae opacae rugoso-reticulatae, areolâ lineari-lanceolatâ a basi fere usque ad mediam faciem interiorem tendente.

Near Mount Graham, S.E. The nutlet resembles that of *P. plurisepalus,* but is rather smaller.

We owe to Mr. Ivan M. Johnston, of the Gray Herbarium, Harvard University, the knowledge that a few Australian plants, erroneously ascribed in the past to *Eritrichium* and *Rochelia,* belong properly to *Plagiobothrys,* Fisch. et Mey. Ind. sem. hort. petrop. 2:46 (1835). *Plagiobothrys* differs from *Eritrichium* by the absence of wings to the nutlet and by the conspicuous dorsal and ventral keels; from *Rochelia* by the attachment of the nutlet to the receptacle or gynobase, the areole in *Rochelia* extending nearly the whole length of the nutlet, while in *Plagiobothrys* it does not extend above the middle of the inner face. The genus is chiefly American.

The following key to the Australian species of *Plagiobothrys* is founded partly on one prepared but not published by Mr. Johnston:—

A. Fruiting calyx-segments 5-8, unequal, curved, hardened, 5-8 mm. long; nutlets 2, rarely 4, 2 mm. long; areole lanceolate, extending from base about ½ way up the inner face .. .. *P. plurisepalus* 1.

A. Fruiting calyx-segments 5, subequal, straight, remaining herbaceous, 2-4 mm. long; nutlets usually 4, about 1½ mm. long.

B. Nutlets glossy, ovoid, the areole small, triangular, oblique, raised considerably above the base .. *P. elachanthus* 2.

B. Nutlets dull, the areole extending from the base to about the middle of the inner face, slightly excavated.

Nutlets oblong-ovoid, 1½-1¾ mm. long, the areole linear-lanceolate .. .. *P. orthostatus* 3.

Nutlets ovoid, about 1¼ mm. long, the areole almost triangular .. .. *P. australasicus* 4.

1. **P. plurisepalus** (F. v. M.) Johnston in Contrib. Gray Herb. 81:75 (1928).—*Maccoya plurisepalea,* F. v. M. Fragm. 1:127 (1859); *Rochelia Maccoya,* F. v. M. ex Benth. Fl. Aust. 4:408 (1869); *R. plurisepalea* (F. v. M.) Druce Rep. bot. exch. cl. Brit. Isles 4:644 (1917).—Western New South Wales and the drier parts of South Australia.

2. **P. elachanthus** (F. v. M.) Johnston l.c. 78.—*Heliotropium elachanthum,* F. v. M. in Linnaea 25:424 (1852); *Eritrichium australasicum,* Benth. Fl. Aust.

4:406 (1869) pro parte non A. DC.—South Australia (Rocky River; Port Lincoln); Victoria (North-western district).

3. **P. orthostatus.** See above.

4. **P. australasicus** (A. DC.) Johnston in Contrib. Gray Herb. 68:75 (1923) et 81:79 (1928).—*Eritrichium australasicum,* A. DC. Prodr. 10:134 (1846); *Allocarya australasica,* Greene in Erythea 3:57 (1895).—Western Australia (Swan River, coll. Drummond, n. 505).

SOLANACEAE.

Solanum ellipticum, R. Br. nov. var. *mollibaccalis.* Bacca mollis esculenta fusca 15-20 mm. diam.—Nov. var. *duribaccalis.* Bacca dura non esculenta flava minuscula. I have been obliged to describe 2 varieties, because it appears impossible to ascertain the nature of the berries of the type, which was collected by Robert Brown at Broad Sound, northern Queensland. In his Prodromus he does not describe the berries and Dunal, in DC. Prodr. 13, 1:298 says there were no berries on the specimens given to him by Brown in 1819. Bentham only says the berry is globular and F. M. Bailey in his Queensland Flora merely copies Bentham's description. The soft juicy purplish berry is eaten by the natives in our northern districts; the hard yellow one is avoided.

MYOPORACEAE.

Eremophila parvifolia, nov. sp. Fruticulus glaber; rami graciles; folia crassa orbicularia vel ovata subsessilia 1½-2 mm. longa; pedunculi solitarii saepe deflexi calycem 2½-3 mm. longum subaequantes; calycis segmenta lanceolata ciliolata basi imbricata non serius amplificata nec scariosa; corolla circiter 10 mm. longa extus glabra, tubo supra campanulato basin versus angustato cylindrico quam limbus ter longiore, labio superiore breviter bifido, labii inferioris lobis lateralibus oblongo-lanceolatis mediano latiore obtuso; stamina inclusa; drupa globosa suculenta 3 mm. diam. saepius bilocularis.

Plains from Fowler's Bay to near Eucla, coll. E. Giles in 1875, R. Tate in 1879.

Nearest to *E. Weldii,* F. v. M., differing in the minute leaves, the smaller corolla with the middle lobe of the lower lip much narrower, the drupe globular and becoming glabrous, instead of ovoid, pointed and hairy at summit, as in *E. Weldii.*

COMPOSITAE.

Brachycome lissocarpa, nov. sp. Planta perennis fere glabra 15-40 cm. alta, rhizomate radicante; caules erecti graciles sed rigidi parce ramosi; folia radicalia linearia vel oblanceolata cum petiolo 5-10 cm. longa integra vel 2-4 lobis lateralibus distantibus linearibus oblongisve acutis 2-10 mm. longis instructa, lobo terminali longiore, caulina similia sed minora, suprema linearia bracteiformia; pedunculi 3-12 cm. longi; involucri bracteae obovato-oblongae circiter 4 mm. longae glanduloso-pubescentes; ligulae 50-80 violaceae vel albae; achaenia oblongo-cuneata plana tenuia circiter 2 mm. longa vix 1 mm. lata, corpore seminifero rubello-brunneo laevi nitente glabro vel primum pilosulo margine angusto crasso albido glabro circumdato, pappo subnullo.

From Encounter Bay northward through the Mount Lofty and Barossa Ranges; South-East.—Victoria (Warrnambool). Near *B. heterophylla,* Benth., of eastern New South Wales, but differs in the microscopic pappus, narrower leaves, and larger flowerheads. (Section *Paquerina*).

Brachycome Tatei, nov. sp. Planta nana perennis glabrescens; caules crassiusculi; folia praecipue caulina crassa carnea obovato-cuneata cum petiolo brevi lato 8-15 mm. longa 5-8 mm. lata integra vel crenata vel breviter

lobata; pedunculi axillares foliis sublongiores parce glanduloso-pilosi; involucrum 4 mm. longum, bracteis obovatis inaequalibus biserialibus; ligulae circiter 12 quasi 5 mm. longae; achaenia maturescentia obovata vel oblongo-cuneata, corpore glabrescente, margine incrassato interdum sparsim ciliato, pappo minuto vel nullo.

Bunda cliffs (west of Fowler's Bay), coll. R. Tate; near Eucla, coll. J. D. Batt. Only known by 3 imperfect specimens in the Tate Herbarium. The tough bases of the leaves are persistent, after the manner of some Eremophilas. The narrower achenes are perhaps those of the ray. (Section *Paquerina).*

Brachycome neglecta, nov. sp. Planta annua glabrescens 3-15 cm. alta, caulibus erectis vel ascendentibus gracilibus ramosis; folia inferiora obovato- vel oblongo-cuneata cum petiolo 1-2 cm. longa 3-10 mm. lata integra vel saepius 3-7 dentibus crassis vel lobis praetexta; pedunculi filiformes 1-4 cm. longi inferne minute glanduloso-pilosi; involucri bracteae obovato-oblongae 2-2½ mm. longae; ligulae 20-30 albae circiter 6 mm. longae; achaenia lineari-cuneata truncata subcompressa apice turgida fere 2 mm. longa infra 1 mm. lata ea radii subtetragona ea disci angusta angularia subclavata omnia saepius sparsim uncinato-pilosa praecipue prope apicem, pappo nullo.—*B. Muelleri,* Tate non Sond.

Southern districts; Murray lands; Yorke and Eyre Peninsulas to Fowler's Bay; Kangaroo Island; South-East. Near *B. iberidifolia.* (Section *Paquerina).*

Brachycome campylocarpa, nov. sp. Planta ut videtur annua glabra absque parte superiore lanatâ petiolorum; caules ramosi crassiusculi rigidiusculi procumbentes ascendentesve 10-20 cm. longi; folia fere omnia in 3-9 lobos lineares pinnatipartita cum petiolo basi dilatato 1-3 cm. longa; pedunculi 2-3 cm. longi; receptaculum valde convexum; involucri bracteae obovatae circiter 4 mm. longae; ligulae latae circiter 12 ut videntur albae; achaenia atra obovato-cuneata subcompressa incurvata 2½ mm. longa apice fere 2 mm. lata, corpore tereti, marginibus duobus aliformibus sed crassis rigidisque crispo-ciliatis superne latis et integris inferne angustatis et crenato-lobatis; pappi setae longiores quam incisura brevis inter margines achaenii.

Minnie Downs (near Diamantina River), coll. L. Reese. The achenes resemble those of *B. Muelleri* in their dull-black color and broad thick margins, but in *B. Muelleri* the achene is almost square in outline and the margins entire, while in *B. campylocarpa* it becomes narrower towards base and the margins become crenate. In the shape of the achene the latter species approaches section *Brachystephium,* but the pappus is erect and it has been placed in section *Paquerina.*

B. goniocarpa, Sond. et F. v. M. nov. var. *eriogona.* Caules erectiores; folia linearia lineari-lobata; achaenii costae marginales lanato-ciliatae.—Near Lake Frome, coll. S. A. White. Perhaps a distinct species.

B. iberidifolia, Benth. nov. var. *glandulifera.* Pedunculi et ramuli plus minusve pilis minutis glandulosis praediti; achaenia obconica apice rotundata vel truncata pilis rectis vel uncinatis plus minusve praedita vel subglabra interiora angustiora saepe clavata.—Flinders Range (southern portion); Wynbring; Everard and Musgrave Ranges.—Central Australia.

Calotis erinacea, Steetz nov. var. *biaristata.* Aristae tantum duae achaenii plano parallelae, non plano oppositae ut in *C. cymbacanthâ.*—Far North and westward to Everard Range and Ooldea. This variety with only 2 awns on the achene was described but not named by Mueller, as long ago as 1859 (Rep. Babbage's Exped. 11) in connection with specimens collected by Hergolt west of Lake Torrens.

Vittadinia pterochaeta (F. v. M.) nov. comb. Planta perennis minute scabro-pilosa 20-30 cm. alta, caulibus erectis ramosis; folia (saltem caulina) obovato-oblonga integra cuneata 1-2 cm. longa; capitula subcorymbosa; involucrum circiter 6 mm. longum, bracteis oblanceolatis subobtusis; ligulae angustae circiter 15-20; achaenia subteretia 4-5 mm. longa pubescentia inconspicue striata; pappi setae plurimae achaenio non longiores subplumosae, barbellis apicem versus abbreviatis.—*V. australis,* A. Rich. var. *pterochaeta,* F. v. M.

Near Hawker (Flinders Range).—Western New South Wales. Differs from *V. triloba* (Gaudich.) DC. in the smaller involucre with mostly obtuse bracts, the achenes inconspicuously striate, the pappus-bristles not longer than the achene and almost plumose.

Vittadinia tenuissima (Benth.) nov. comb. Planta perennis glabrescens 15-30 cm. alta, caulibus saepius erectis ramosis; folia angusto-linearia plerumque 1-2 cm. longa, margine arcte involuta ita ut subfiliformes et supra 1-sulcata videantur; capitula subcorymbosa; involucrum 7-8 mm. longum, bracteis lineari-lanceolatis; ligulae circiter 15-20 caeruleae vel violaceae angustae; achaenia 4-5 mm. longa puberula utrinque circiter 6-costata; pappi setae simplices achaenio sublongiores.—*V. australis,* A. Rich. var. *tenuissima,* Benth.

Southern districts; Yorke Peninsula.—New South Wales. Differs markedly from the preceding species and from *V. triloba* in the very narrow-linear leaves, 1-furrowed above by the closely involute margins and from *V. pterochaeta* in the simple and longer bristles of the pappus.

Vittadinia megacephala (F. v. M.) nov. comb. Planta perennis scabro-pilosa, caulibus simplicibus erectis vel ascendentibus foliosis 10-20 cm. altis capitula majuscula solitaria terminalia ferentibus; folia oblanceolata in petiolum angustata radicalia persistentia 2-4 cm. longa integra vel grosse paucidentata caulina breviora et integra; involucrum 10-14 mm. longum, bracteis lineari-lanceolatis; ligulae circiter 30-40 purpurascentes; achaenia plana cuneata 7-8 mm. longa puberula sed laevia et ecostata inter duos margines crassos; pappi setae plurimae capillares valde inaequales achaenio longiores.—*V. australis,* A. Rich. var. *megacephala,* F. v. M.

Drier districts north of Adelaide (Dublin scrub, Munno Para); Murray lands (at least west of the river). Belongs to the section *Eurybiopsis,* with smooth achenes; differs from other species in the large flowerheads solitary at the summit of unbranched leafy stems.

V. triloba (Gaudich.) DC. nov. var. *lanuginosa.* Variat indumento lanato praecipue in caulibus; achaenii costis tenuissimis.—*Eurybiopsis gracilis,* Hook. f. Southern districts of South Australia.—Tasmania.

Olearia microdisca, nov. sp. Fruticulus viscidus; rami graciles rigidi erecti pilis brevibus crispis parce tomentosi; folia approximata plerumque erecta et saepe appressa lineari-oblonga crassa 1½-2½ mm. longa circiter ¾ mm. lata sessilia, marginibus recurvis faciem inferiorem tomentosam interdum tegentibus; capitula sessilia solitaria ramulos laterales foliosos 5-25 mm. longos terminantia; involucrum angustum circiter 3 mm. longum, bracteis obtusis pallidis; ligulae 2-5 circiter 3 mm. longae styli ramis ter longiores; flores disci 2 3; achaenia pubescentia, pappi setis 25-35.

Near Maitland and Ardrossan, Y.P.; Kangaroo Island. Has the habit of *O. teretifolia,* but differs in the smaller leaves and involucres and in the hairy clothing. The disk-flowers appear never to exceed those of the ray in number and are usually fewer.

Senecio orarius, nov. sp. Perennis glaber circiter $1\frac{1}{2}$ m. altus; folia lanceolata vel oblonga 2-6 cm. longa, omnia auriculis dentatis amplexicaulia, inferiora in lobos latos pinnatifida, superiora dentata; capitula multa in paniculam laxam corymbosam disposita; involucrum cylindratum 6-7 mm. longum e bracteis 12 et nonnullis parvis basilaribus constans; ligulae 4-8 circiter 4 mm. longae; flores disci quasi 25; achaenia pubescentia.—*S. lautus,* Sol. var. *lanceolatus,* Benth.

Beachport, S.E.—Southern Victoria. Resembles *Erechthites prenanthoides* to some extent.

S. lautus, Sol. nov. var. *pilosus.* Caulis simplex tantum 12 cm. altus in specimine nostro; folia pinnatipartita pilis brevibus crispis septatis obsita.

Franklin Island (Great Bight); coll. T. G. B. Osborn. The glabrous form is also found on the island.

Cassinia complanata, nov. sp. Frutex viscosissimus; rami brunnei, saepius pilis minutis patentibus obsiti; folia anguste linearia, 1-3 cm. longa, supra glabra, facie inferiore marginibus revolutis occultâ; capitula plurima, in paniculam corymbosam valde longiorem quam longam saepius complanatam conferta; involucrum teres, $3\text{-}4\frac{1}{2}$ mm. longum, bracteis obtusis, obscure albis, interdum quinquefariis; flores 4-8; achaenia glabra.

Encounter Bay; Kangaroo Island; Yorke Peninsula to Flinders Range; Murray lands; 90-Mile Desert.—Victoria (near Bendigo).

Differs from *C. aculeata,* R. Br. in the glabrous upper surface of the leaves; from *C. laevis,* R. Br. in the denser and flatter panicle; from both in the glabrous achenes.

Helichrysum Basedowii, n. sp. Planta ut videtur annua, gracilis, erecta, 20-30 cm. alta, sparsim et laxe lanata; folia linearia, pleraque 1-2 cm. longa, basi semi-amplexantia, glabrescentia; capitula solitaria, pedunculos minute sparsimque bracteatos et foliatos terminantia; involucrum late campanulatum, 5 mm. longum, bracteis aureis, lanceolatis, longe ciliatis, acutis, exterioribus sessilibus, lanulatis, interioribus cum ungui lineari glanduloso et parvâ laminâ erectâ; flores bisexuales multi, pauci de extimis feminei; achaenia papillosa; pappi seta in omnibus floribus solitaria, apicem versus fere plumosa.

Musgrave Ranges; July, 1926. Named after the collector, Dr. H. Basedow, M.P., who has brought back valuable plant collections from all his expeditions in the interior of Australia. Nearest to *H. ambiguum,* Turcz., from which it differs in its probably annual character, its strongly papillose achenes, and especially in the solitary pappus-bristle of all the flowers, both female and bisexual.

ABORIGINAL ROCK PAINTINGS SEVEN MILES NORTH OF BLANCHETOWN, RIVER MURRAY, SOUTH AUSTRALIA.

By Harold L. Sheard.

[Read October 11, 1928.]

Plate XXI.

Through the courtesy of the Board of Governors of the South Australian Museum, Messrs. H. M. Hale (Curator) and N. B. Tindale (Ethnologist) were enabled to accompany me on a recent brief trip to the River Murray.

One of our objects was to endeavour to locate a series of aboriginal rock carvings casually mentioned by J. W. Bull,(1) in an extract from Major O'Halloran's diary of an expedition against the natives of the Rufus tribe, under date of June 15, 1841. These we were unable to locate owing to the vagueness of his remarks, and the limited time (three days) available. It is possible that this series is situated further north than we travelled.

We were fortunate, however, in discovering a rock shelter containing aboriginal ochre paintings and charcoal drawings. Several shelters have previously been recorded containing rock carvings (2) and (3), but this is the first instance of aboriginal ochre paintings from the River Murray.

The rock shelter is situated about seven miles north of Blanchetown, on the western side of the river, at the southern end of the "Haylands" sheep station (Messrs. Winnall Bros.), about two miles south of the homestead, on Section 37, Hundred of Hay. The shelter faces east and extends for 27 feet in a north and south direction. It is approached by a talus slope at the base of the cliffs, the bank gradually rising to about 20 feet above high river level, the cliffs, ascending almost sheer for a further hundred feet. The shelter overlooks a large river flat with a lagoon thereon which extends for several miles to the north, and terminates about 250 yards to the south, where the main channel of the river washes the base of the cliffs, forming a bend, turning from a westerly to a southerly direction.

The roof of the shelter at the widest part has an overhang of 8 feet, and is almost horizontal, but the floor, being somewhat uneven, the height varies from 6 to 10 feet. Differential weathering of the Miocene rock has hollowed out the shelter at the base of the cliffs producing three ledges of strata which form the rear wall (see text figs. A and B and pl. xxi., fig. 1). Another hard section of rock forms the roof, which is much blackened by the smoke from the natives' fires.

The irregular outer face of the central ledge (fig. A *e)* was covered with paintings; a few were also present on the top ledge (fig. A *f)*. Two portions from the strata *(e* and *f)* had become detached and dropped about 17 inches, but otherwise they had retained their original positions. These rocks form the northern wall of the shelter and also bear on their surfaces paintings and a few scratches and markings of native origin. Some paintings and carvings are also present on other rocks in the vicinity.

(1) Bull, J. W., Early Experiences of Colonial Life in South Australia, Adelaide, 1878, p. 161.

(2) Hale, H. M., and Tindale, N. B., Rec. S. Austr. Mus., iii., No. 1, 1925, pl. iv., fig. 4.

(3) Sheard, H. L., Trans. Roy. Soc. S. Austr., li., 1927, pp. 18, 19, and 137-140.

The floor is composed of ashes and *débris* from the cliff, and also contains quantities of fresh water bivalve shells. Sections of the floor deposits were obtained. The following table shows the depth in inches at four places (see fig. A, *a, b, c, d*):—

	a	*b*	*c*	*d*
Sterile sand ..	35	8	4	4
Ashes and shells	31	28	14	6

The upper layer is composed of sterile sand and *débris*, weathered from the cliffs. The second layer consists of continuous banded ashes, interspersed with *Unio* shells, which were most plentiful at the base of the deposit between *b* and *c*.

About 60 and 90 feet to the north, two further rock shelters were located; these bear similar traces of long occupation, but do not contain examples of native art.

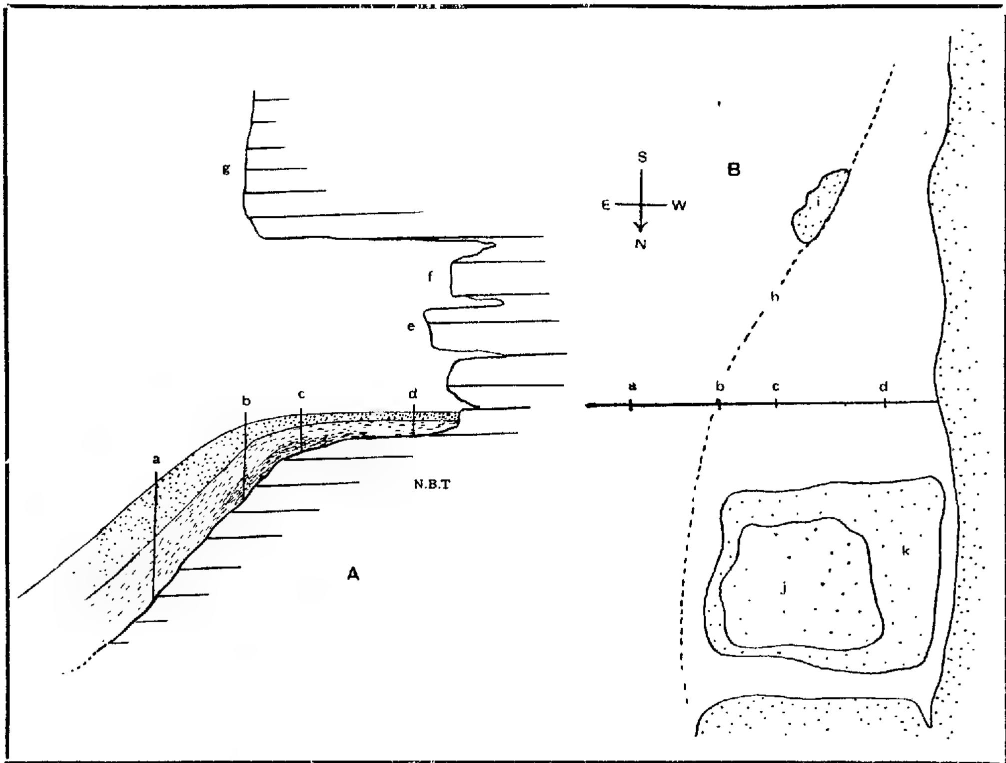

Fig.: A.—Diagrammatic section of Rock Shelter. Fig.: B.—Plan.
(a-d, Positions of measurements of the depth of deposit; e, stratum bearing the principal series of paintings; f, upper series of paintings; g, smoke-blackened cliff-face; h, limit of roof of shelter; i-k, fallen masses of stone).

Examples of the principal types of designs are shown in text fig. C. No. 1 is situated on the southern end of ledge *e* and is overlain with a further figure in charcoal. A similar figure to this is carved into the rocks at Wongulla.[4] Nos. 2 to 8 follow next in order from south to north; some of these are somewhat weathered. Nos. 9 to 12 occur on the northern end of ledge *f*. No. 10 is painted in a groove left by a fossil which has weathered from the rock. Nos. 13

(4) Hale and Tindale, *loc. cit.*, pl. iv., fig. 4.

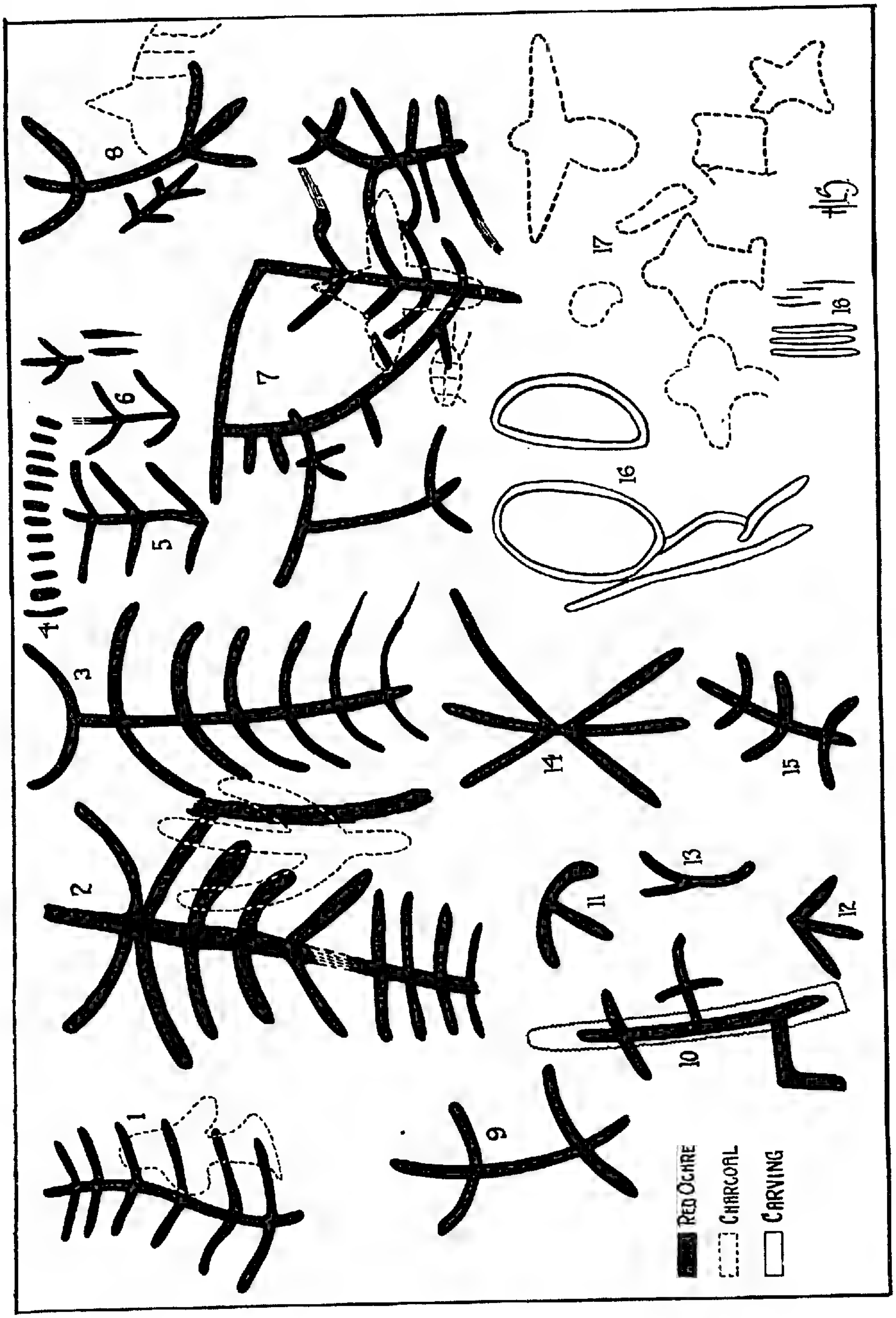

Fig. C.

and 14 are situated about 5 feet above the bank on the cliff face approximately 15 feet north of shelter. No. 15 is painted on a conical projection in a fissure of the cliff about 40 feet north from the main shelter. No. 16 represents two large groovings about an inch in width cut into the cliff face, 30 feet south of the shelter. No. 17 shows several charcoal drawings outlined on the cliff at the southern end. No. 18 is a series of straight line markings cut into the rock; these are similar to the so-called "Tally marks."

Most of the designs are executed in a bright red ochre which has been mixed into a paste and roughly painted direct on to the rock. In a few instances this colour has been mixed with some darker pigment giving an almost purple colouring, while in one or two cases the red has been overlaid with a yellow paste somewhat similar in colour to that of the surrounding rock. As shown in text fig. C, charcoal designs have been superimposed over the ochre paintings in several places; these markings are somewhat inconspicuous, owing to the underlying mass of paintings, and the true outlines are only revealed on a close scrutiny of the rock. They present an entirely different facies to the older ochre paintings. In some instances weathering has depleted the work, and, as is often the case with native paintings, earlier designs are overlaid by later efforts.

Summary.

This is the first record of native paintings from the River Murray. A ground plan and section of the shelter are given, also drawings of the native designs, with photographs of the shelter, and of a portion of the painted rock.

I am indebted to Messrs. Hale and Tindale for their assistance in the preparation of this paper.

DESCRIPTION OF PLATE XXI.

Fig. 1. "Haylands" Rock Shelter, River Murray.

Fig. 2. Southern end of Ledge E showing designs. This portion of rock measures 20 x 40 inches.

THE ESSENTIAL OIL OF PHEBALIUM ARGENTEUM, Smith.

By H. H. Finlayson.

[Read October 11, 1928.]

This rutaceous plant is widely distributed over the lower south-western portion of Western Australia and, in particular, is a conspicuous undergrowth species in the Karri Forest between Denmark and the Margaret River. It has long been notorious for the painful results which accrue from contact of the skin with the under surface of the leaves, and the blistering which is so produced has earned it the local name of "Blister Bush."(1)

When crushed, the leaves of *Ph. argenteum* emit a powerful, rich, fruity smell, and a sample of the plant which the writer brought back to Adelaide from Wyadup Brook, in March, 1926, on this account drew the attention and interest of the late Professor E. H. Rennie. Although the essential oils of several species of the genus have been examined, we could find, at the time, no published account of that of *Ph. argenteum,* and the work which is summarized in this paper is the result of the suggestion of Dr. Rennie, that the volatile constituents of this species also, should be investigated.

With this end in view, the Forest Department of Western Australia was approached, and through the courtesy of the Conservator, a parcel of branchlets was collected and forwarded to us in September, 1926. Unfortunately, the material underwent fermentation *en route,* and arrived in poor condition for distillation, but subsequently all difficulties in obtaining material were solved by the co-operation of the Forest Department and the firm of Plaimar Ltd., of Perth, the former undertaking the collecting of the material and the latter its distillation, and I desire to extend my cordial thanks to Mr. S. L. Kessell, the Conservator of Forests in Western Australia, and to Mr. H. V. Marr,(2) Managing Director of Plaimar Ltd., for their great kindness in coming so freely to our aid.

The death of Dr. Rennie in January, 1927, prevented that collaboration between us which was intended, and prevented also the public expression of his thanks to the gentlemen named; in adding his acknowledgments to my own, I do as he would wish.

Examination of the Leaf Oil.

In forwarding the results of the distillation, Mr. Marr reports that 391 kilos of leaves treated 24 hours after plucking gave 696 grms. of oil, a yield of ·18 per cent. When examined by the writer three months later the product was found to be a mobile liquid of pale straw colour and reproduced the odour of the fresh plant with considerable though not absolute fidelity. It had the following constants -- $\alpha_{D}^{16.5^{\circ}} = +26{\cdot}73^{\circ}$; $D_{16 \cdot 5}^{16 \cdot 5} = {\cdot}8663$; $n_{D}^{18^{\circ}} = 1{\cdot}4765$; E.V., $=40{\cdot}8$; E.V. (after acetylation)$=65$.

Before resorting to a systematic fractionation, the virgin oil was submitted entire to the action of a number of reagents, with a view to the removal of such

(1) The physiological properties of the plant have no place in the present investigation; but it may be noted that either its activity is subject to seasonal variation or there is considerable variation in individual susceptibility to the effect. The costal thickets of *Phebalium* are inhabited by colonies of *Setonyx brachyurus*, and in setting snares for this wallaby, branches of the plant were frequently stripped of their leaves with the naked hand, and otherwise freely handled, by myself and a companion, without ill effect. This in January.

(2) A small quantity of the oil was prepared by Mr. Marr some years previously and certain preliminary observations made upon it. These were not published.

compounds as might react, thus simplifying the subsequent examination of fractions.

1. *5 per cent. Caustic Soda.*—On agitating measured volumes of the oil with cold 5 per cent. caustic soda, no perceptible diminution in volume took place. On acidifying the aqueous layer a slight turbidity was produced, due to a trace of the higher free fatty acids dealt with later. Small amounts of *formic acid* were detected also, but phenols were absent.

2. *Normal Sodium Sulphite.*—The odour of the oil at a certain stage in its evaporation was distinctly suggestive of both citral and citronellal, and as it gave a slight affirmative Schiff's reaction, the treatment with the above reagent was resorted to in order to separate them if present. On prolonged agitation of the faintly acidified solution with the oil, the reagent failed to develop an alkalinity, and examination of the aqueous layer gave no evidence of the presence of aldehydes. This result was not modified by omitting the cold alkali treatment.

3. *Sodium Hydrogen Sulphite.*—On agitating the oil with an equal volume of a 30 per cent. solution of this salt containing a small amount of free sulphur dioxide a slow formation of a somewhat gelatinous addition product took place, the amount continuing to increase during 24 hours. At the end of this time it was filtered off at the pump, washed free from oil with alcohol, and then decomposed by distillation with aqueous sodium carbonate. From the distillate an oil of powerful rue-like smell was separated which boiled between 180°-240° (760 mm.), and which proved to be a mixture of at least three closely related, *saturated, aliphatic ketones.* On fractionation at ordinary pressures about two-thirds of the liquid was obtained boiling between 185°-195°, and yielding a semicarbazone which after crystallization from alcohol melted constantly at 118° C. An intermediate fraction (200°-220°) and a small quantity of high boiling residue gave semicarbazones which melted, respectively, at 113° and 121°.

Positive identification of these ketones was not effected owing to the small quantity isolated, but there is considerable probability that the first is *methyl heptyl ketone* and the third *methyl nonyl ketone.* The regenerated ketones amounted to about 2 per cent. of the oil taken, but owing to the difficulties introduced by the slow formation of the double compound and its gelatinous nature, it is very likely that the amount present is considerably greater. The ketones make a notable contribution to the odour of the oil, and their removal is at once apparent to the sense of smell.

No aldehydes were present in the ketone mixture and none were separated from the bisulphite mother liquor.

4. *Alcoholic Caustic Potash.*—Preliminary tests showed that the esters which were present, boiled over a wide range; it was resolved, therefore, to remove them by saponification and examine their acid and alcohol radicals, separately. Saponification was effected by three hours' refluxing with large excess of 10 per cent. alcoholic potash; after diluting with water the insoluble material was separated and the aqueous solution acidified. An unexpectedly large amount of oily acids were thus liberated which were recovered by extraction with ether and removal of the solvent. On distillation of the residual oil it passed over between 170°-245° (760 mm.) and proved on examination to be a complex mixture of *saturated fatty acids.* The separation of individuals from this mixture of homologues proved a difficult matter, but on fractionation there was a tendency for the distillate to accumulate between 175°-185°, and in larger quantities (nearly 50 per cent. of the whole) between 200°-210° C.

In the first of these fractions the presence of a *valeric acid* was strongly suspected, but neither a homogeneous silver salt nor any other crystalline derivative, could be prepared from it. The fraction 200-210 yielded a mixture of

potassium salts which was recrystallized from absolute alcohol until it appeared homogeneous under the microscope; the potassium salt was then converted into the very slightly soluble silver salt which was analysed. Found, Ag=48·70%. (Theory for C_5H_{11} Coo Ag=48·43%.)

The identity of the main constituent of this fraction with *n. caproic acid* was fixed by the preparation of the amide. The acid was warmed at 60° with a slight excess of thionyl chloride, and after half an hour the cooled reaction mixture was cautiously dropped into saturated aqueous ammonia. On standing, a small yield of *n. caproic amide* separated, which after recrystallization from 30 per cent. alcohol melted at 100·5° C. The presence of *formic acid* has been mentioned; the intermediate acetic, propionic, and butyric acid appear to be quite absent.

The Unsaponifiable Portion.

The unsaponified residue from the alcoholic potash treatment (constituting the great bulk of the oil) was recovered from the ethereal solution and submitted to a systematic fractionation at 10 mm. with the following results:—

B.P.	Weight (per cent. of original oil)	D_{16}^{16}	α_D^{23}	n_D^{20}
x-60°	4	·8512	+41·43°	1·4655
60-70°	45	·8423	+52·77°	1·4735
70-100°	2	·8606	+10·74°	1·4590
100-120°	16	·8901	— 4·90°	1·4835
120-140°	6·5	·9088	+ 0·4°	1·4970
140-175°	4	·9564	+ 7·23°	1·5015
Residue	8	—	—	—

Hydrocarbons.

Fractions 1 and 2 consisted almost entirely of terpenes, and with a view to as complete a separation of individuals as possible, was submitted to a long series of fractionations through a 12-pear still head at 10 mm. pressure, with the following results:—

B.P.	Weight (per cent. of terpene fract.)	D_{17}^{17}	n_D^{17}	α_D^{17}
(a) 45-50°	5	·8551	1·4628	+25·50°
(b) 50-55°	4	·8564	1·4652	+32·22°
(c) 55-59°	28	·8526	1·4666	+41·58°
(d) 59-62°	63	·8469	1·4663	+76·60°

(a) The physical constants and smell of fraction 45-50° suggested the presence of pinene, and by Wallach's method 5 cc. of it yielded 0·7 grms. of a nitrosochloride, which was at once converted into the condensation product with benzylamine. This crystallized well in needles melting sharply at 123° C., and caused no depression in the M.P. of an authenticated sample of α pinene nitrol benzylamide. α pinene was therefore present, the dextrovariety predominating.

(b) Camphene was suspected in this fraction, but an attempt to confirm its presence by conversion into isoborneol was not successful.

(c) and *(d)* These fractions consisted largely of *dextrolimonene*, but its identification was greatly embarrassed by the presence in small amount of other terpenes, about which very little could be learned.

A dextrolimonene tetrabromide [3] of M.P. 103°-104° was obtained in very poor yield (4 grms. from 25 cc. of fraction *d)*, but a nitrosochloride was obtained in much larger proportion, amounting in some experiments to two-thirds of the weight of hydrocarbon taken. This nitrosochloride was satisfactorily characterised by conversion into anilides, the free and limonene nitrolanilide being isolated from the reaction mixture in the form of large lemon-yellow prizms of M.P. 111-112°.

A further quantity of nitrosochloride was converted into a crude carvoxime, which, however, could not be satisfactorily purified.

Fractions 5 and 6 consisted largely of a *sesquiterpene* or mixture of sesquiterpenes, and a partial separation of the oxygenated derivatives was effected by shaking repeatedly with 30 per cent. alcohol in which the hydrocarbons were very sparingly soluble. After repeated distillations of the residue over sodium a fraction was obtained having: B.P. (10 mm.), 122-126° and $\alpha^{0}_{D} = -2{\cdot}6°$; $D^{16}_{16} =$ ·8983 and $n^{2'}_{D}$ 1-4920. As these values were not unaffected by further treatment, and as no crystalline derivatives were obtained, it is impossible to more than speculate as to the identity of the sesquiterpenes present.

Alcohols.

The recent identification by Mr. A. R. Penfold of butyl and amyl alcohols in the oil from *Phebalium dentatum*, lead to a careful search being made for these low boiling alcohols in the saponification liquors of the oil of the present species, but with negative results.

The ester value of the original oil after acetylation indicated an alcoholic content of about 19 per cent. (calculated as $C_{10}H_{18}O$), or 27 per cent. (calculated as $C_{15}H_{24}O$), and determination of the acetyl value of individual fractions localised the alcohol content chiefly in fractions 4 and 6.

From fraction 100-120°, by treatment with phthalic anhydride a mixture of alcohols was isolated having a rich rose-like smell and the following constants:—B.P. (10 mm.), 110°-115°; α^{20}_{D} —0·6°; D^{16}_{16} ·8684; n^{21}_{D} 1·4730.

The presence of *geraniol* in relatively large amount in this mixture was proved by the preparation of a silver geranyl phthalate of M.P. 134°-135°, and that it was accompanied by *l. citronellol* was strongly suggested by the smell, the laerorotation, and the indifference of a small residual portion (17 per cent.) to rigorous formylation.

Of the sesquiterpene alcohols which were present in fraction 140°-175° a very small portion only could be separated from the polymerization products which constituted its bulk; this substance, which was got out as a phthatic ester, and is presumably a primary alcohol, had: B.P. (10 mm.), 160°-170° C, and n^{21}_{D} 1·5030; but lack of material prevented further examination.

Other Compounds.

On chilling the fraction 140°-175° before the treatment with phthalic anhydride, about 4 mm. grms. of crystalline material slowly separated. After washing free from adhering oil the substance melted at 165° (correct) and had a very sweet, persistent, coumarin-like smell. Attempts to augment the quantity in hand by extraction of the resinous residues with alcohol were not successful.

(3) As the less soluble dipentene tetrabromide was not obtained, it may be inferred that the low rotation of the fraction was due to the laerorotation of the unidentified terpenes present.

Fruit Oil.

In inspecting the herbaceous material prior to distillation, Mr. Marr formed the opinion that the flowering tops of the plant, which had partly gone to seed, contained a larger proportion of oil than the leaves. A trial distillation of a small quantity of this material supported this view, by giving a yield of ·73 per cent. of oil. Although its dextro rotation is considerably lower, its composition appears to be essentially the same as that of the leaf oil. It has the following constants:—$\alpha_D^{16\cdot5} = +14\cdot4°$; $D_{15}^{16\cdot5}$ ·8617; n_D^{18} 1·4725; E.V., 23; E.V., (after acetylation), 66.

In addition to the oils, samples of the aqueous forerun and of the residual still liquor, were forwarded, but the examination of these has afforded no results of interest.

Summary.

The essential oil of *Phebalium argenteum*, Smith, has been shown to consist to the extent of 50 per cent. or more of a mixture of terpenes of which *d. limonene* is chief. Sesquiterpenes are also present in considerable amount. Of the oxygenated constituents, there have been determined (1) *geraniol, citronellol,* and at least two sesquiterpene alcohols; (2) esters of these alcohols with a mixture of saturated fatty acids, largely *n. caproic acid;* (3) a mixture of saturated aliphatic ketones, probably including *methyl heptyl ketone* and *methyl nonyl ketone;* (4) small amounts of a substance of coumarin-like smell of M.P. 165°.

University of Adelaide, September 24, 1928.

MISCELLANEA.

NOTES ON DREAMS OF AUSTRALIAN ABORIGINES.

By J. Burton Cleland, M.D.

Professor C. H. Seligman, F.R.S., has expressed a wish that a record should be made of dreams amongst uncivilized and primitive races. From the Royal Anthropological Institute, Great Russell Street, London, a circular was sent out with directions as to the collecting of such records. An opportunity occurred of obtaining information about dreams in our aboriginals when at Cordillo Downs two or three years ago. It will be noted that in the first of these the black boy, apparently a fearless horseman and an excellent rider, nevertheless, in spite of his expertness, occasionally dreamt of being bucked off the horse he was riding. It seems clear, then, that the subconscious element of fear accompanies the native, or at least some natives, when riding on horse-back, though this fear is so controlled that one might consider them as being almost "fearless."

The dream of the gin about finding a large fat baby in the water and wishing to feed it on "yabbies," well illustrates the maternal instinct, which in the gins is strong.

The accounts of these two examples of dreams are as follow: -

A black boy, a station hand on Cordillo Downs, in the extreme north-east of South Australia, when questioned as to whether he ever had dreams, and, if so, of what did he dream, replied that he usually dreamt of horses, in which he was riding them and in danger of being bucked off. Sometimes he would wake before reaching the ground, and on other occasions *after* reaching it, and then he would feel himself to see if he had really been hurt. He had never had dreams of being hungry and rarely of being with a gin.

At Cordillo Downs Mrs. Murray made inquiries for me amongst the house gins as to the occurrence of dreams. They did not remember any at the time, but a day or so later Mrs. Murray informed me that one gin, Caroline, had had the following dream:—Caroline, with other gins, was bathing in a water-hole. She found a large fat baby in the water. Maggie (another gin) tried to take it from her. She wanted to give it something to eat, so she stooped down in the water to try and find a "yabbie," but could not. This gin was married and had had several children, perhaps six, twins amongst them.

Evening Meeting, April 12, 1928.

ABSTRACT OF THE PROCEEDINGS

OF THE

ROYAL SOCIETY OF SOUTH AUSTRALIA

(Incorporated)

FOR THE YEAR NOVEMBER 1, 1927, TO OCTOBER 31, 1928.

ORDINARY MEETING, NOVEMBER 17, 1927.

Professor J. B. CLELAND was in the chair, and 45 members present.

Minutes were read and confirmed.

Owing to an irregularity in the time of calling the meeting, no elections or nominations were made.

PAPERS—

Messrs. C. P. MOUNTFORD and P. S. STAPLETON read a paper on "Aboriginal Rock Intaglios near Teetulpa Station," which was discussed by Dr. T. D. Campbell, Messrs. P. S. Hossfeld and A. M. Lea, and Professor H. H. Woollard.

The postponed discussion of Dr. C. FENNER's paper on "Adelaide and its Surroundings: a Study in Human Geography," was opened by Dr. Ward. Professor Howchin said that the value of Dr. Fenner's paper was in its generalizations and an interpretation of facts that were already known. He agreed with the author of the paper in his view that the Miocene fossiliferous beds were laid down before the epeirogenic uplift of the Mount Lofty Ranges, and therefore these fossiliferous beds originally covered most of this elevated region within a certain distance from the coast line. The present distribution of these Miocene beds is most peculiar; they occur in patches ranging from 1,600 feet below sea level to 900 feet above sea level, and extended from the present shore line, inland, to the latitude of Peterborough in the north. The great rift valley of the gulfs was one of the deepest holes on the surface of the earth. Measured from the top of Mount Lofty (which represents the former normal level of the country), it is between 4,000 and 5,000 feet deep, almost rivalling the Dead Sea in this respect, only, while the sea had never invaded the Jordan Valley and filled up the sunken deep of the Dead Sea, the great rift of South Australia has become choked with sediments from successive incursions of the sea as well as alluvial wash from the higher ground. An important fact bearing on the age of the great sunkland near Adelaide is that it contains the thickest deposits (amounting to about 1,000 feet) of the fossiliferous Miocene beds known in Australia. This fact can be explained in one or other of two ways. If the fracture of the earth's crust near Adelaide did not occur until the close of the Miocene transgression, then the 1,000 feet of deposit within the rift represents the original thickness of the marine sediments over the land as a whole. On the other hand, it is possible that the fracture in the rocks commenced in pre-Miocene times, and, by reason of its gradual subsidence, received a greater measure of deposits than the more stable and shallow sea bed on the higher levels. Professor Howchin stated that while he and Dr. Fenner were in agreement on most points, there was one point—and an important point, too—in which the author of the paper claimed

to differ from him. This had reference to the origin of the alluvial deposits of the country. Dr. Fenner calls in question the former existence of the meridional river system, and concludes that the alluvial deposits of the country had their origin in fault-aprons laid down along the bases of fault scarps. Dr. Fenner does not seem to have recognised that the alluviation of South Australia belongs to two very distant periods—one older, and a newer one; the one Pleistocene, the other Recent. The distinction between these two hydrographic systems can be clearly defined. They differ:—

(1) Lithologically, the newer system deposits are loose and unconsolidated; the older are highly indurated and silicious and often contain silicified trunks of trees. These beds, which resemble quartzites, are quarried and broken for road metal, as well as used as building stones.

(2) The two systems have their own respective hydrographic outlines, the older including trunk lines with radial tributaries, now obsolete.

(3) There is an unconformity between the two systems, they are not coincident, and the newer system is superimposed on the older.

(4) The older system is characterised by high-level deposits often occupying the highest points in a locality.

(5) The material in the older river system has been subjected to extreme attrition and wear, the smaller particles are often as round as small shot, and the larger, like cricket balls, bearing testimony to the long distances they have travelled.

The speaker then said that he thought that when Dr. Fenner had become more conversant with the facts of the case he would modify his conclusions. The paper was also discussed by Mr. Hossfeld, and Dr. Fenner replied.

Exhibits.—Professor W. Howchin exhibited a fragment of a large glacial erratic, of gneissic type, obtained from the railway cutting at Eden railway station. Professor J. A. Prescott showed photographs of soil profiles at Urrbrae. Mr. W. W. Weidenbach exhibited specimens of vein gold from New Guinea gold mines at Bilolo Creek. Mr. A. M. Lea exhibited some cotton-boll worms, the larvae of the moth *Heliothis obsoleta,* at present doing much damage to lucerne, peas, tomatoes, and other crops in South Australia.

Ordinary Meeting, March 8, 1928.

The President (Dr. J. B. Cleland) in the chair, and 46 Fellows present.

The Minutes of the previous meeting were read and confirmed.

Dr. Cleland said—Before proceeding with the business of the evening, I would like to express from the chair our sense of deep loss at the death of our senior Vice-President, Edgar R. Waite, and my prospective successor in the Presidential chair, and our sympathy with his family. As President, I wrote to Mrs. Waite soon after our colleague's death. Both your Honorary Secretary and President saw Mr. Waite during his short illness in Hobart, and only a few hours before his death. Mr. Hale will present this evening an obituary notice of Mr. Waite, so I will merely say now that we, as a Society, can ill spare the loss of a colleague so willing, learned, versatile, and tactful, and that the scientific world of Australia has suffered a grievous loss.

Nominations.—Mr. L. G. Melville, B.Ec., A.I.A., Government actuary, Kingswood; Miss J. C. Hurcombe, artist, New Parkside; Mr. P. Ifould, company manager, Burnside; Mr. S. H. Hirst, F.L.S., Zoological Department, University, Adelaide; Mr. H. Showell, fruit grower, Renmark; Mr. M. S. Hawker, pastoralist, Walkerville and Aldgate.

Elections.—Vice-President: Dr. Fenner was elected unanimously. Member of Council: Mr. J. F. Bailey was elected unanimously. Fellow: Miss V. Taylor, business manager, Malvern, was elected unanimously.

Obituary Notices.—An obituary biography of Mr. Edgar R. Waite, F.L.S., C.M.Z.S., was read by Mr. H. M. Hale. An obituary biography of Mr. H. Y. L. Brown was read by Dr. Keith Ward. On the resolution of the Chairman, the Secretary was instructed to send letters of sympathy to Mrs. Waite and Mrs. Brown. [See *ante*, pp. 1-4.]

Papers—

Mr. N. B. Tindale read a paper on "The Languages of Eastern Arnhem Land," one of a series on the natives of the Gulf of Carpentaria. Vocabularies of the languages of nine tribes were given, together with comparative notes. The paper was discussed by Rev. J. C. Jennison.

Mr. Herbert M. Hale contributed a paper on "Australian Cumacea (Crustacea)." This paper dealt, in the main, with Cumacea collected by Sir Joseph Verco, the late Mr. Waite, and the author. Eight new species were described, and one form was, for the first time, recorded from Australia.

Dr. T. D. Campbell read a paper, subject, "Dental Notes." This was a contribution from the results of the Adelaide University Field Anthropological Expedition to Central Australia in January, 1927.

Mr. W. H. Baker contributed a paper on "Australian Sphaeromidae (continued)."

Exhibits.—Messrs. Hale and Tindale exhibited a cinematograph film, taken during the South Australian Museum Expedition to Cape York, in 1927. This portrayed the daily life of natives—swimming, fishing, preparation of food from mangrove fruits, and many other interesting items. Mr. A. M. Lea exhibited specimens and photographs of the small dried-fruit moth, *Plodia interpunctella*, the most serious enemy of dried fruits in Australia; also of a braconid wasp parasite, *Hebracon juglandis*, which, to a certain extent, controls it; and the remarkable life history of which has been recently elaborated by Mr. H. Showell. Dr. L. Keith Ward tabled the new Geological Map of South Australia, and described its details and the technical excellence of its reproduction.

Ordinary Meeting, April 12, 1928.

The President (Dr. J. B. Cleland) in the chair, and 41 members present.

The Minutes of the previous meeting were read and confirmed.

Visitors present were Dr. McIntosh, of Bendigo, and Dr. C. Chewings.

Elections.—The following were elected as Fellows: Mr. L. G. Melville, B.Ec., A.I.A., Government actuary, Kingswood; Miss J. C. Hurcombe, artist, New Parkside; Mr. P. Ifould, company manager, Burnside; Mr. S. H. Hirst, F.L.S., Zoological Department, University, Adelaide; Mr. H. Showell, fruit grower, Renmark; Mr. M. S. Hawker pastoralist, Walkerville and Aldgate.

Papers—

Mr. P. S. Hossfeld, "The Geology and Physiography of part of the Northern Mount Lofty Ranges." This paper described the physical and geological features of the areas between Hamilton and Mount Pleasant in detail. The paper was discussed by Dr. L. K. Ward.

Mr. N. B. Tindale, "Australian Mole Crickets." This paper was withdrawn, and is to be published in the Records of the South Australian Museum.

Dr. J. B. Cleland read "Notes on Dreams of Australian Aborigines."

Dr. C. Chewings, "Further Notes on the Stratigraphy of Central Australia." This paper was communicated by Mr. W. W. Weidenbach, and

illustrated by sections. The paper was discussed by Dr. L. K. Ward, who made remarks on the location of the Horn Valley; Mr. C. T. Madigan, on fossils in the Horn Valley; and Professor Howchin on the age of Cryptozoa. Dr. Chewings also spoke on the paper.

Exhibits.—Mr. A. M. Lea exhibited a collection of lace bugs recently identified by Mr. Hacker, of the Queensland Museum; the species are all small but of great interest; a few are destructive to fruit trees, others occur in mosses, and a few in nests of ants, but most of them live on native shrubs. He also exhibited some of the poisonous Katipo spiders *(Latrodectus hasselltii).* Mr. N. B. Tindale exhibited an interesting collection of mole crickets of the Fam. Gryllotalpidae. At least two South Australian species are troublesome to gardeners and agriculturists, destroying crops by burrowing in the surface soil amongst the root systems of plants and by gnawing the bases of their stems.

Ordinary Meeting, May 10, 1928.

The President (Dr. J. B. Cleland) in the chair, and 45 members present.

The Minutes of the previous meeting were read and confirmed.

Nomination.—Mr. A. E. Scott, B.Sc., chemist, Kent Town.

Correspondence.—A letter was read from the Barrier Reef Commission, giving details of work of the 1928 Expedition.

Papers—

Professor Walter Howchin, F.G.S., "The Sturtian Tillite and Associated Beds on the Western Scarps of the Southern Flinders Ranges." In a discussion on this paper, Professor Sir Edgeworth David said that, as one who had had the privilege of working with Professor Howchin for the last thirty years, he would like to ask if there were any marked changes in the tillite as one proceeds from south to north. Also, was there a possible disconformity of the slate below the tillite. It would be interesting to discover disconformity in this vast area. It gave him great pleasure to say that, in recently following Professor Howchin in the field, he noticed an unabated energy in mind and body in one to whom Australia owes so much for placing on record one of our most salient geological features. Professor David then referred to the late H. Y. L. Brown as a great chartographer, with a flair for the salient features. Mr. Brown mapped South Australia, Central Australia, Northern Territory, a great part of Western Australia, and part of New South Wales, and, up to the last, was able to help Dr. Keith Ward in the preparation of the new geological map of South Australia.

Professor Sir Edgeworth David, "Notes on Newly-discovered Fossils in the Adelaide Series." Professor David said that there was ample material to provide work for young scientific workers, and that quite big forms of life would be found in the "blue metal" limestone. He, himself, claimed to be a local worker, and has had the material before him for thirty years, and has only recently detected the nature of the fossils; all the time he was looking for the wrong thing. Professor Howchin had largely provided the material, and he (Professor David) stated that Adelaide was a "Paradise for geologists." Professor Cleland, in proposing a vote of thanks to Sir Edgeworth for coming from Sydney on purpose to deliver this lecture, said that his discovery of forms of life in limestone 500,000,000 years old was more wonderful than any fairy story.

Ordinary Meeting, June 14, 1928.

The President (Dr. J. B. Cleland) in the chair, and 40 members present.

The Minutes of the previous meeting were read and confirmed.

Election.—Mr. A. E. Scott, B.Sc., chemist, Rundle Street, Kent Town.

Papers—

Mr. P. D. Riddell, "Ordered Arrangement of Stones by Aborigines at Durham Downs, Cooper's Creek, Queensland." Dr. Bernard Dawson discussed the paper, and said that he noticed a resemblance between the Alabeena groups and the stones buried under the round burrows, also a circle of round stones similar to those found on Salisbury Plain. The outlying megalith was also of interest standing outside the circle, and there was a great likeness between Alabeena and the European circles. Mr. Stapleton referred to a discovery of arranged stones in Western Australia, also reports of such occurrences in Victoria and in the Tatiara district of South Australia. Mr. Tindale mentioned an occurrence reported by Mr. Aiston, at Killallpaninna, in which there were two circles connected by curved pairs of lines 25-30 feet in length.

Mr. Arthur M. Lea, F.E.S., "Australian Curculionidae of the sub-families Haplonycides and Cryptorhynchides." This paper was illustrated by beautiful photographs taken by Mr. N. B. Tindale, and many of the species included in the paper were exhibited by the author.

Mr. E. Ashby, "Notes on a Collection of Chitons from the Capricorn Group, Queensland."

Exhibits.—Mr. W. W. Weidenbach exhibited Pre-Cambrian slate or phyllite and Brighton limestone from bores put down in searching for oil. Mr. A. M. Lea exhibited a sample of cayenne pepper attacked by the bread beetle. According to Mr. Lea, this beetle formed 25 per cent. of the food of the British naval ratings in the old days. He also exhibited a collection of insects from the African Soudan, whence they had been sent by Mr. McDiarmid, Heiban, Anglo-Egyptian Soudan; the most interesting of which was a large dynastid with mouth parts arranged in the identical method which obtains amongst our Australian species. Also, blood-sucking flies, mosquitoes, March flies, and robber flies. Mr. Lea pointed out that, unlike mosquitoes, both male and female of the March flies are biting insects. Mr. Tindale observed that March flies went on feeding after amputation of the abdomen. Dr. Ward exhibited and explained a section map showing sections across South Australia. Mr. Edwin Ashby exhibited specimens of some of the rare birds he had collected during his trip to Dirk Hartog Island, Western Australia, in September last. He stated that Dirk Hartog Island is over 500 miles north of Perth, is long and narrow, being over 60 miles in length, and is separated from an extension of the mainland on the south by two miles of water; from Peron Peninsula, on the east, by 20 miles of water called Denham Sound; and at the northern end is separated from Carnarvon, situated at the mouth of the Gascoyne, by about 80 miles of Shark Bay. He showed examples of both male and female of the black and white wren *(Malurus leucopterus)* which is only found on this island and on Barrow Island, 400 miles further to the north. Mr. Ashby showed a skin he had collected from Peron Peninsula, at Denham, only separated by 20 miles of water from the homestead on Dirk Hartog Island, of the nearly allied blue and white wren *(Malurus cyanotus)*, in which many black feathers are scattered amongst the blue ones, and the blue colouration is many shades darker than occurs in typical specimens of that species; an example from Leigh's Creek, in South Australia, was shown for comparison. Examples of the Dirk Hartog Island emu wren *(Stipiturus malachurus hartogi)* were shown, and also a typical example from Victoria, collected by the speaker in July, 1886, near Cranbourne. The island form is quite a dwarf, although the length of the peculiar tail feathers is about the same, also the colouration of the island subspecies is much paler. Several specimens of the Dirk Hartog Island rock field wren *(Calamanthus montanellus hartogi)* were shown; also an example of the dominant species *(Calamanthus montanellus)* from the type locality, the Stirling Range. The island form is very distinct. Mr. Ashby suggested that

the change from blue to black in the plumage of the wren had been brought about through some ecological condition due to proximity to the coast and the occurrence of the same bird on Barrow Island, 400 miles further north, was not evidence, as had been suggested, of the survival on the two islands of the earlier type, but due to the existence of similar ecological conditions. An example of the northern white-plumed honey eater *(Meliphaga penicillata carteri)*, collected by him near the Gascoyne, was shown in comparison with the typical form occurring near Adelaide. It was pointed out that the yellow-plumaged *(carteri)* exhibits the divergence from type due to dry or desert conditions. He also showed what seemed to be a new species of scrub wrens *(Sericornis)* which he collected on the trip.

Ordinary Meeting, July 12, 1928.

The President (Dr. J. B. Cleland) in the chair, and 33 members present.

The Minutes of the previous meeting were read and confirmed.

Nomination.—Dr. J. G. Davies, B.Sc., Ph.D., assistant agronomist, Waite Institute.

Paper—

Mr. Edwin Ashby, "Further Notes on Western Australian Chitons." The material dealt with represented 20 different species collected by himself last October and November at Nornalup, on the southern coast; and at the Quarantine Station, near Fremantle.

Demonstration.—Professor J. A. Prescott gave an interesting demonstration on soil profiles, illustrated by a series of pictures in a Russian publication. He said that the general tendency is to classify soils according to their fertility, but the physical characters are more interesting and important. The Russians introduced the science of Pedology—abstract soil description without taking into consideration the geological or chemical characters, and Russian terms have been incorporated into the international description of soils. The following varieties of soils were mentioned:—(1) *Tundra* (carefully described by Charles Darwin), which has a permanently frozen subsoil. (2) *Podsols*, ash-like soils characterising a large part of Northern Europe, south of the Tundra. This soil has a definite profile in which the upper layer is grey and the subsoil reddish-brown. This layer contains all the iron, alumina, and lime which has been letched from the surface and often forms a hard pan. In Tasmania podzolic soils are marked in the lacustrine area outside Launceston. (3) *Chernozems*.—Black soils, the lower layer of which contains calcium carbonate nodules. In South Australia the only black soils are swamp and Bay of Biscay soils. A profile of Bay of Biscay soil from McLaren Vale was exhibited. There are black soil plains in western New South Wales extending into Queensland. South of these in New South Wales there is a junction with the red soils. (4) *Chestnut-brown soils*, developed under a drier and warmer climate. (5) *Brown soils*, lighter in colour than the last, with the zone of carbonate nearer the surface. (6) *Grey desert soils*, where the subsoil comes to the surface. (7) *Alkali soils*, derived from formations rich in salt. (8) *Laterites*, supposed to be formed by the wasting of rocks under tropical conditions, as in some parts of Western Australia. These are called duricrust soils by Dr. Woolnough. The address was discussed by Professor A. E. V. Richardson, Dr. C. A. E. Fenner, and Messrs. R. L. Jack, C. T. Madigan, and H. Showell.

Exhibits.—Mr. A. M. Lea exhibited a drawer containing the life history of a looper caterpillar *(Chlenias pini)*, very destructive to the Remarkable Pine *(Pinus insignis)*. At the Mount Burr forest reserve, in December last, about 800 acres were seriously attacked by the larvae, but no moths appeared till June.

At the present time they are laying millions of eggs on the trees. In the drawer were samples of an ichneumon wasp parasite which is helping to keep the pest in subjection. He also showed some cockchafer larvae (Malolonthides) that are now seriously injuring pasture at Port Lincoln and elsewhere in South Australia. Mr. W. J. Kimber exhibited a fossil operculum of a Turbo from upper beds north of Blanche Point, Port Willunga. It resembled the operculum of *Turbo stamineus*, Martyn; found in crumbling, polyzoal formation. It was the only specimen Mr. Kimber had seen during many years of collecting. Mr. E. Ashby exhibited Chitons in illustration of his paper.

Ordinary Meeting, August 9, 1928.

The President (Dr. J. B. Cleland) in the chair, and 25 members present.

Minutes of the previous meeting were read and confirmed.

Nominations.—The following were nominated as Fellows:—Mr. B. G. Maegraith, medical student, University; Miss Effie W. Deland, B.Sc., demonstrator, 34 Trevelyan Street, Wayville; Mr. R. J. Best, M.Sc., A.A.C.I., acting lecturer, University, Adelaide.

Election.—Dr. J. G. Davies, B.Sc., Ph.D., was unanimously elected a Fellow.

The President reported that he, with the Secretary and Treasurer, had waited on His Excellency the Governor, who had promised to act as Patron, and had signed the Society's book and promised his photograph.

Papers—

Mr. Albert H. Elston, F.E.S., "Notes and Descriptions of a New Species of the genus *Pseudotetralobus*, fam. Elateridae." The paper was discussed by Mr. A. M. Lea, who compared the joints of *Tetralobus* with those of *Eurycanthus (Cerambycidae)* as a parallel.

Mr. E. V. Clark, B.Sc. (communicated by Professor W. Howchin), "A Recent Raised Beach near Port Turton, Yorke Peninsula." In a discussion on Mr. Clark's paper, Professor Howchin said that Mr. Clark's observations were an acceptable addition to our knowledge of the raised beaches of our local seaboard. These raised sea beaches were of great interest as recording the alternations of the land in relation to the sea level that have occurred within the geological period known as Recent or sub-Recent. These raised beaches are of two ages, and in relation to their fossil remains, are of two kinds. The older of these gives evidence that, at that time, the climatic conditions of southern Australia were warmer than they are to-day. The large warm-water foraminifer *Orbitolites complanata* lived abundantly in these waters, as well as certain mollusca, as *Arca trapezia,* and others, which have migrated to lower latitudes and are quite extinct in South Australian waters. A curious fact as to the occurrence of this older raised sea bed is, that on some parts of southern Yorke Peninsula, this bed is above high-water mark, while in the neighbourhood of Adelaide, within the limits of the Great Rift Valley, it is again below sea level, and is dredged in the Port Creek and Outer Harbour. The newer raised beach forms the raised bank of Lefevre's Peninsula, the raised estuarine area of the River Torrens, that goes as far inland as Dry Creek, and is found at many places around our shores. The shells and other organic remains that are found in this bed are all similar to those now living in the adjoining waters. We have thus in recent times a record of, first, dry land conditions, then a depression with sea deposits, followed by an elevation into dry land conditions; then a second depression, followed by a second elevation that passes into present-day times. Mr. Clark's example appears to belong to this newer elevation of the sea bed.

Professor Harvey Johnston noted the occurrence of triplet birth in a *Trachysaurus*, which, from its rarity, would appear to be worth recording. He also gave an interesting demonstration of specimens showing the processes of fertilization in (1) sea urchins and (2) round worm. This was illustrated by slides and diagrams prepared by Miss Deland.

Exhibits.—Mr. H. M. Hale exhibited a section of down pipe from Reynella, showing unusual concentric depositions of mineral salts leading eventually to almost total occlusion. (2) Also a cast of a fish with tumour formation, viz., myoma of the gill cover. (3) *Trachysaurus rugosus*, a monstrous form with two heads. (4) *Toxotes*, the archer fish of Northern Australia, which brings down its prey by projecting a stream of water from its mouth. Mr. A. M. Lea exhibited a large collection of walking-stick insects from various parts of Australia, also stomach contents of a magpie (showing that magpies eat germinating wheat) and of a white cockatoo. Mr. N. B. Tindale exhibited photographs of Oodnadatta natives taken about 1900; also portion of mineralized aboriginal skull.

Professor Harvey Johnston asked for contributions of aboriginal photographs for the South Australian Museum collection.

Ordinary Meeting, September 13, 1928.

The President (Dr. J. B. Cleland) in the chair, and 35 members present.

Messrs. Shepherd, Nicholls, and Rolland were welcomed as visitors.

Minutes of the previous meeting were read and confirmed.

Nomination.—Ivan F. Phipps, Ph.D., assistant geneticist, Waite Institute.

Elections.—Mr. B. G. Maegraith, medical student, University, Adelaide; Miss Effie W. Deland, B.Sc., demonstrator, 34 Trevelyan Street, Wayville; Mr. R. J. Best, M.Sc., A.A.C.I., acting lecturer, University, Adelaide.

Mr. B. S. Roach's motion on the establishment of a medal to be called the Sir Joseph Verco medal was discussed. He stated that the Council had decided to institute the medal, but the affirmation of the general meeting was required. The medal was to be awarded from time to time in recognition of important scientific work. Mr. Roach described the medal, and after a discussion on the frequency of award, etc., in which Drs. Lendon and Fenner and Messrs. Selway and Madigan joined, it was decided to defer final consideration until the October meeting.

Papers—

Mr. Arthur M. Lea, F.E.S., "Supplementary Descriptions of Cryptorhynchides." Mr. Elston said, "We are under a great debt of gratitude to Mr. Lea in systemising the weevils of Australia, which he has been studying for many years."

Mr. C. T. Madigan, "Preliminary Notes on New Evidence as to the Age of Formations on the North Coast of Kangaroo Island." The formations referred to extend along the north coast of the island from Point Marsden to Stokes Bay, and are referred to as the Point Marsden Series. The boulder beds near the base of the series were found to contain blocks of Archaeocyathinae limestone up to 3 feet in diameter. Slate beds in the series were found to contain well-preserved tracks of crustaceans and other structural features of a peculiar kind. Professor Howchin said that the discovery made by Mr. Madigan and party was of a most interesting kind. Although these beds had been known previously, the discoveries now made included two new features, namely, the occurrence of large boulders of Archaeocyathinae limestone and the presence of certain impressions on the slabs of the nature of fossil footprints or tracks. There are two aspects of the subject that remain in doubt—the origin of those beds and their geological age. One

thing is certain, the boulders are not of local origin, but have undergone transportation, either by water action or by ice. Judging by his knowledge of these beds in the Point Marsden section, it is in no sense a conglomerate. The angularity of the fragments, both large and small, together with their perfect freshness, including the crystalline particles, such as felspar and calcite, as well as the promiscuous arrangement of the erratics (for they are that, whether of ice transport or not) suggest glacial transport rather than stream action. The Archaeocyathinae limestone of the boulders does not clearly correspond with that found near Normanville, or Sellick's Hill, or Yorke Peninsula, but has a closer resemblance to that in the Flinders Ranges, while the other included stones are unlike any rocks that are known, *in situ*, in South Australia. So far as can be judged by the lines of dispersion that operated during the ice age of the Sturtian and Permo-Carboniferous tillites, the drainage was from south to north, and it is not impossible that the transported material in these beds came from the southward, beyond the present limits of the continent. As to the geological horizon of these beds, the author favoured an Ordovician age. That might be possible, but Professor Howchin did not think it probable. There are no definitely known Ordovician beds in South Australia south of the McDonnell Ranges. The relationship of these beds to the local Permo-Carboniferous glacial beds is not clearly defined. It appears that in his (Professor Howchin's) description of the Point Marsden beds, an unconformity is reported to exist between them. In the lapse of thirty years his memory was hazy as to the nature of that unconformity. In glacial stratigraphy contemporaneous unconformity is by no means uncommon, and it may yet turn out that the Point Marsden beds are a specific development of the Permo-Carboniferous, determined by the nature of the ground over which the ice moved. The beds in general have no likeness to the Sturtian tillite. The author's suggestion that the latter may be at a higher horizon than the Archaeocyathinae limestone is impossible. In the clearly defined succession of the Adelaide Series in the type district, near Adelaide, there is no uncertainty as to the relationship of these two horizons. The Sturtian tillite is in the (?) Proterozoic division, while the Archaeocyathinae are in Middle Cambrian, with some 10,000 feet of sediment separating them. To put a Proterozoic formation above the Middle Cambrian is impossible. He hoped that this interesting discovery would be followed up by further observations so as to arrive at the truth. Mr. W. W. Weidenbach and Dr. Fenner also discussed the paper, and Mr. C. T. Madigan replied.

Members of the Adelaide University Anthropological Expedition to Koonibba gave a short account of the work carried out. Professor J. B. Cleland on the blood tests; Dr. T. D. Campbell on the physical anthropology and cinematography; Dr. R. H. Pulleine on sight and hearing tests, eye examinations, colour vision, intelligence and other tests, carried out by Professor H. H. Woollard and himself. Mr. N. B. Tindale described the photograph work done and cultural anthropology, and exhibited specimens to show the method of obtaining water from the red mallee *(Eucalyptus oleosa)*. An unusual exhibit was the brush holder for carrying the eggs of the native pheasant. Dr. Harold Davies was present, but the time available did not allow of his demonstrating the excellent records he obtained of native songs. The results of the Expedition will be presented to the Society in a series of papers in the coming year.

Exhibits.—Professor W. Howchin exhibited a number of rock specimens from Point Marsden (K.I.) for the purpose of comparison with the beds recently discovered by Mr. Madigan on the western side of Emu Bay (K.I.). The specimens, which were of a unique kind, were collected by the exhibitor some thirty years ago, and were described in the Transactions of the Society (vol. xxiii., 1899). The section from which the rocks were taken is about 30 feet

in thickness and consists mainly of a softish and unmetamorphosed sandstone in which occur eight distinct beds of conglomerates or breccias. The stones forming these conglomerate beds are angular and foreign to the neighbourhood, and seem to indicate a glacial origin, although somewhat different from the Permo-Carboniferous tillite as seen elsewhere in South Australia. The sandstones that form the principal feature in the section are quite distinct from the quartzites of the Adelaide Series. Mr. C. T. MADIGAN exhibited laterite crystals of felspar and graphic granite found in pegmatite, an example of pegmatite showing all the minerals in it. Also branches of *Eucalyptus cneorifolia* and a bottle of the Eucalyptus oil obtained from it.

ANNUAL MEETING, OCTOBER 11, 1928.

THE PRESIDENT (Dr. J. B. Cleland) in the chair, and 32 Fellows present. Apologies were received from Dr. L. Keith Ward and Dr. C. Fenner.

Mr. MADIGAN protested against the practice of including in the Minutes any criticism written subsequent to the meeting.

The Minutes of the previous meeting were read and confirmed.

The Annual Report was read and adopted.

Mr. ROACH asked for a motion endorsing the employment of Mr. Glastonbury as Auditor in place of Mr. Hackett, absent.

The Balance-sheet was read and adopted.

ELECTION OF OFFICERS.—*President*, L. Keith Ward, D.Sc.; *Vice-Presidents*, Professor T. Harvey Johnston and Dr. C. Fenner; *Members of Council*, T. D. Campbell, D.D.Sc., Mr. A. M. Lea, and Sir J. C. Verco; *Hon. Treasurer*, Mr. B. S. Roach; *Auditors*, Messrs. Hackett and Whitbread; *Hon. Secretary*, Dr. R. H. Pulleine.

ELECTION OF FELLOW.—Ivan F. Phipps, Ph.D., assistant geneticist, Waite Institute.

The leaflets referring to grants offered to research workers under the Commonwealth Science and Industry Endowment Fund were brought before the Fellows.

Suggested conditions of the proposed medal for award were brought forward by Mr. Roach. The suggested conditions were as follows:—

1. That the medal be of bronze.
2. From enquiries made it is estimated that the making of the die for the medal will cost less than £20. Each medal struck from the die will cost (with inscriptions) about 17s. 6d.
3. That it be known as the Sir Joseph Verco medal, in recognition of the important service that gentleman has rendered to the Royal Society of South Australia.
4. That these words be on one side of the medal: "The Sir Joseph Verco Medal for Research."
5. That on the other side of the medal a piping crow-shrike be engraved, the emblem on the South Australian Coat of Arms, with a surrounding wreath of eucalypt.
6. That the words "Awarded by the Royal Society of South Australia," the name of the recipient, and the year be engraved on each medal.
7. That the Council select the person to whom it is suggested that the medal shall be awarded, and that this name be submitted to the

Fellows at an ordinary meeting to confirm or otherwise the selection of the Council.

8. That the medal be awarded for distinguished scientific work published by a member of the Royal Society of South Australia.

It was put to the meeting that conditions 1 to 4 be adopted. This was carried.

PAPERS—

Professor Dr. J. B. CLELAND, "Australian Fungi: Notes and Descriptions, No. 7." The author stated that the paper was a technical description of agarics similar to the common mushroom.

Mr. H. H. FINLAYSON, "The Essential Oil of *Phebalium argenteum*." *Phebalium argenteum* is a rutaceous shrub distributed over the lower south-western portion of Western Australia. It is well known locally as "Blister Bush," owing to the painful effects which are produced by the leaves on contact with the skin. Professor Cleland said that he had vigorously rubbed the leaves of this plant on the back of his hand; forty-eight hours later a blister formed which suppurated and left a white patch visible for about ten years.

Mr. J. M. BLACK, "Additions to the Flora of South Australia, No. 26." The author stated that it was a purely technical paper on specimens accumulated by indefatigable collectors and encountered during the revision of South Australian plants for the British Science Guild Handbook. Professor Cleland said that the Flora of South Australia, by Mr. Black, was a monumental work, the best of recent times, and he asked for contributions of plants from outback.

Mr. H. L. SHEARD, "Aboriginal Rock Paintings Seven Miles north of Blanchetown." This was the first record of paintings from the district. Designs and photographs illustrating the paper were submitted.

Mr. N. B. TINDALE, "Ethnological Notes from Arnhem Land and Tasmania." Mr. Tindale recorded a new type of implement made from a wallaby scapula, which he discovered in a cave in Arnhem Land. He also exhibited a Tasmanian shell necklace strung by the aborigine, Truganinni. Rev. J. C. Jennison said that he had never seen the bone implements in Arnhem Land.

ANNUAL REPORT

FOR THE YEAR ENDED SEPTEMBER 30, 1928.

Acceding to the request made to the Council by thirteen Fellows, the ordinary meetings began this year in March.

Sir Douglas Mawson, a former President of the Society, was awarded the Nachtigall medal by the Geographical Society of Berlin during his visit to Europe.

Our Honorary Fellow, Sir T. W. Edgeworth David, visited the Society in May, and read a paper entitled "Notes on Newly-discovered Fossils in the Adelaide Series."

During the year the Society has sustained the loss by death of two prominent Fellows—Mr. E. R. Waite (Vice-President) and Mr. H. Y. L. Brown, who was elected in 1883. Biographies of these deceased Fellows appear in the present volume.

Mr. J. F. Bailey was elected by the Council as its representative on the Fauna and Flora Board in place of the late E. R. Waite.

Professor T. Harvey Johnston represented the Society on the Board of Governors of the Public Library, Museum, and Art Gallery. Professor Johnston,

at the request of the Board, accepted the position of Honorary Director of the Museum.

Mr. H. M. Hale, another Fellow of this Society, has been elected Curator of the Museum.

Our representatives at the Hobart meeting of the Australasian Association for the Advancement of Science were Professor J. A. Prescott and Dr. C. A. E. Fenner.

The Library Committee dealt with a large amount of correspondence and arranged several new exchanges.

Papers on Geology were contributed by Professor W. Howchin, Dr. Chewings (communicated by Mr. W. W. Weidenbach), Mr. A. V. Clark (communicated by Professor W. Howchin), Mr. C. T. Madigan, and Mr. P. S. Hossfeld. It is hoped that the valuable paper and maps presented by Mr. Hossfeld will be published through the good offices of the Commonwealth Government.

Biological papers have been contributed by Messrs. H. M. Hale, W. H. Baker, N. B. Tindale, A. M. Lea, E. Ashby, and A. H. Elston.

Anthropology is represented by papers by Professor J. B. Cleland, Dr. T. D. Campbell, and Messrs. N. B. Tindale and P. D. Riddell.

Two interesting demonstrations were given at evening meetings—one by Professor J. A. Prescott on Soil Profiles; and the second, on the Fertilization of the Ovum, by Professor T. Harvey Johnston.

The attendance at Council meetings was as follows:—Professor J. B. Cleland, 7; Professor T. Harvey Johnston, 7; Professor W. Howchin, 9; Professor J. A. Prescott, 7; Sir Joseph Verco, 4; Dr. L. K. Ward, 6; Dr. C. A. E. Fenner, 4; Mr. B. S. Roach, 9; Mr. A. M. Lea, 7; Mr. J. M. Black, 7; Mr. J. F. Bailey, 7; late E. R. Waite, 1; Dr. R. Pulleine, 7.

J. B. Cleland, *President.*

Robert Pulleine, *Hon. Sec.*

ROYAL SOCIETY OF SOUTH AUSTRALIA (INCORPORATED).

Receipts and Payments Account for the Year ended September 30, 1928.

RECEIPTS.

	£	s.	d.	£	s.	d.
To Balance, October 1, 1927				650	11	5
,, Subscriptions	135	8	0			
,, Field Naturalists' Section	47	5	0			
				182	13	0
,, Grants from Government—						
On Subscriptions	156	15	0			
For Printing Reports and Scientific Investigation	150	0	0			
				306	15	0
,, Use of Room by other Societies				3	11	0
,, Sale of Publications				15	16	11
,, Interest—						
Savings Bank Account	21	8	6			
Transferred from Endowment Fund	185	5	6			
				206	14	0
				£1,366	1	4

PAYMENTS.

	£	s.	d.	£	s.	d.
By Transactions—						
Printing	399	10	0			
Illustrating	123	8	9			
Publishing	14	7	4			
				537	6	1
,, Grant to Field Naturalists' Section				50	0	0
,, Library—						
Librarian	60	13	6			
Bookbinding	45	11	0			
				106	4	6
,, Sundries—						
Cleaning and Lighting	8	16	0			
Printing, Postage and Stationery	18	3	1			
Insurance	6	15	0			
Geophysical Lecture	5	1	6			
Bank Account Fee	0	5	0			
				39	0	7
,, Balance, September 30, 1928—						
Savings Bank of South Australia	531	10	8			
Bank of Australasia .. £107 18 6						
Less outstanding Cheque 5 19 0						
	101	19	6			
				633	10	2
				£1,366	1	4

Audited and found correct,

O. GLASTONBURY, A.A.I.S., A.F.I.A., } Hon.
HOWARD WHITBREAD, } Auditors.

B. S. ROACH, Hon. Treasurer.

Adelaide, October 9, 1928.

ENDOWMENT FUND.

(Capital . . £4,069 6s. 10d.)

	£	s.	d.	£	s.	d.
1927—October 1.						
To Balance, S.A. Government Stock	4,064	18	9			
Savings Bank	4	8	1			
				4,069	6	10
1928—September 30.						
,, Interest received				185	5	6
				£4,254	12	4

		£	s.	d.	£	s.	d.
1928—September 30.							
By Revenue Account					185	5	6
,, £500 S.A. Govt. Stock	@ 3% ...	292	8	9			
,, £2,000 S.A. Govt. Stock	@ 3¾%	1,997	10	0			
,, £900 S.A. Govt. Stock	@ 5¼% ...	900	0	0			
,, £875 S.A. Govt. Stock	@ 5½% ..	875	0	0			
		4,064	18	9			
,, Savings Bank Account		4	8	1			
					4,069	6	10
					£4,254	12	4

Audited and found correct,

O. GLASTONBURY, A.A.I.S., A.F.I.A., } Hon.
HOWARD WHITBREAD, } Auditors.

B. S. ROACH, Hon. Treasurer.

Adelaide, October 9, 1928.

DONATIONS TO THE LIBRARY

FOR THE YEAR ENDED SEPTEMBER 30, 1928.

TRANSACTIONS, JOURNALS, REPORTS, ETC.,
presented by the respective governments, societies, and editors.

AUSTRALIA.

AUSTRALASIAN ANTARCTIC EXPEDITION, 1911-14. Sci. rep., s. C, v. 8, pt. 4.
AUSTRALASIAN INSTITUTE OF MINING. Proc., no. 64-66. Melb. 1926-27.
AUSTRALIA. *Bureau of Census and Statistics.* Year-book, no. 20, 1927. Melb.
——— *Council for Sci. and Industrial Research.* Bull. 33-35. Journ., v. 1, no. 2-5. Pamphlet 4-7. Report 1. Sci. abstr., v. 7, no. 1-3. Melb. 1926-28.
——— *Great Barrier Reef Committee.* Reports, v. 2. Brisb. 1928.
AUSTRALIAN JOURNAL OF EXPERIMENTAL BIOLOGY, v. 4; 5. Adel. 1927-28.
AUSTRALIAN VETERINARY ASSOCIATION. Journ., v. 3; 4, no. 1-2. Syd.

SOUTH AUSTRALIA.

ADELAIDE UNIVERSITY. *Animal Products Research.* Rep., no. 7. Adel. 1927.
PUBLIC LIBRARY, MUSEUM, AND ART GALLERY OF S.A. Rep., 1926-27.
——— Records of S. A. Museum, v. 3, no. 4; 4, no. 1. Adel. 1928.
ROYAL GEOGRAPHICAL SOCIETY OF A/SIA (S.A. Br.). Proc., v. 27-28. 1925-26.
SOUTH AUSTRALIA. *Dep't of Mines.* Review, no. 46-47. Adel. 1927-28.
——— *Geological Survey.* Bull., no. 13. Report, 1926-27. Adel.
——— *Woods and Forests Dep't.* Report, 1927. Adel.
SOUTH AUSTRALIAN NATURALIST, v. 8, no. 4; v. 9. Adel. 1927-28.
SOUTH AUSTRALIAN ORNITHOLOGIST, v. 9, pt. 4-7. Adel. 1927-28.

NEW SOUTH WALES.

AUSTRALIAN MUSEUM. Magazine, v. 3, no. 4-7. Records, v. 16. Syd. 1927-28.
LINNEAN SOCIETY OF N.S.W. Proc., v. 52, pt. 3-5; v. 53. Syd. 1927-28.
MAIDEN, J. H. Critical revision of the genus Eucalyptus, pt. 69. Syd.
——— Sir Joseph Banks, "The Father of Australia." Syd. 1909.
NEW SOUTH WALES. *Board of Fisheries.* Report, 1925-26. Syd.
——— *Dep't of Agriculture.* Gazette, v. 38-39. Sci. bull. 29-30. 1927-28.
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LIST OF FELLOWS, MEMBERS, ETC.

AS EXISTING ON SEPTEMBER 30, 1928.

Those marked with an asterisk (*) have contributed papers published in the Society's Transactions. Those marked with a dagger (†) are Life Members.

Any change in address or any other changes should be notified to the Secretary.

Note.—The publications of the Society will not be sent to those whose subscriptions are in arrear.

Date of Election.

Honorary Fellows.

1910. *Bragg, Sir W. H., K.B.E., M.A., D.Sc., F.R.S., Director of the Royal Institution, Albemarle Street, London (Fellow 1886).
1926. *Chapman, F., A.L.S., National Museum, Melbourne.
1897. *David, Sir T. W. Edgeworth, K.B.E., C.M.G., D.S.O., B.A., D.Sc., F.R.S., F.G.S., Emeritus Professor of Geology, University of Sydney, Coringah, Sherbroke Road, Hornsby, N.S.W.
1898. *Meyrick, E. T., B.A., F.R.S., F.Z.S., Thornhanger, Marlborough, Wilts, England.
1926. Spencer, Prof. Sir W. Baldwin, K.C.M.G., Litt.D., M.A., D.Sc., F.R.S., Emeritus Professor of Biology in the University of Melbourne, Director of the National Museum, Melbourne.
1894. *Wilson, J. T., M.D., Ch.M., Professor of Anatomy, Cambridge University, England

Fellows.

1926. Abel, L. M., Wilson Street, South Broken Hill.
1925. Adey, W. J., 32 High Street, Burnside, S.A.
1927. *Alderman, A. R., B.Sc., West Terrace, Kensington Gardens, S.A.
1895. *†Ashby, Edwin, F.L.S., M.B.O.U., Blackwood, S.A.
1917. Bailey, J. F., Director Botanic Garden, Adelaide.
1902. *Baker, W. H., King's Park, S.A.
1926. Beck, B. B., 127 Fullarton Road, Myrtle Bank, S.A.
1927. Birks, Leslie, Park Terrace, Parkside.
1902. *Black, J. M., 82 Brougham Place, North Adelaide.
1912. *Broughton, A. C., The "Grosvenor," North Terrace, Adelaide.
1911. Brown, Edgar J., M.B., D.P.H., 175 North Terrace.
1924. Browne, J. W., B.Ch., 169 North Terrace, Adelaide.
1916. *Bull, Lionel B., D.V.Sc., Laboratory, Adelaide Hospital.
1923. Burdon, Roy S., B.Sc., University of Adelaide.
1921. Burton, R. J., Belair.
1922. *Campbell, T. D., D.D.Sc., Dental Dept., Adelaide Hospital, Frome Road.
1924. Cavenagh-Mainwaring, W. R., M.B., B.S., 207 North Terrace.
1907. *Chapman, R. W., C.M.G., M.A., B.C.E., F.R.A.S., Professor of Engineering and Mechanics, University of Adelaide.
1904. Christie, W., c/o Griffiths Bros., Hindmarsh Square, Adelaide.
1895. *Cleland, John B., M.D., Professor of Pathology, University of Adelaide.
1907. *Cooke, W. T., D.Sc., Lecturer, University of Adelaide.
1924. de Crespigny, C. T. C., D.S.O., M.D., 219 North Terrace, Adelaide.
1916. Darling, H. G., Franklin Street, Adelaide.
1927. *Davies, Prof. E. Harold, Mus.Doc., The University, Adelaide.
1927. Dawson, Bernard, M.D., F.R.C.S., 8 King William Street, Adelaide.
1915. *Dodd, Alan P., Prickly Pear Laboratory, Sherwood, Brisbane.
1921. Dutton, G. H., B.Sc., F.G.S., Agricultural High School, Murray Bridge.
1911. Dutton, H. H., B.A., Anlaby, S.A.
1902. *Edquist, A. G., 19 Farrell Street, Glenelg.
1918. *Elston, A. H., F.E.S., 189 Wattle Street, Malvern.
1925. England, H. N., B.Sc., Commonwealth Research Station, Griffith, N.S.W.
1917. *Fenner, Chas. A. E., D.Sc., 42 Alexandra Avenue, Rose Park.
1927. *Finlayson, H. H., The University of Adelaide.
1923. Fry, H. K., D.S.O., M.B., B.S., B.Sc., Glen Osmond Road, Parkside.
1919 †Glastonbury, O. A., Adelaide Cement Co., Brookman Buildings, Grenfell Street.
1923. Glover, C. J. R., Stanley Street, North Adelaide.
1927. Godfrey, F. K., Robert Street, Payneham, S.A.
1904. Gordon, David, 72 Third Avenue, St. Peters.

Date of Election.

1925. †GOSSE, J. H., 31 Grenfell Street, Adelaide.
1880. *GOYDER, GEORGE, A.M., B.Sc., F.C.S., 228 North Terrace.
1910. *GRANT, KERR, M.Sc., Professor of Physics, University of Adelaide.
1904. GRIFFITH, H., Hove, Brighton.
1916. HACKETT, W. CHAMPION, 35 Dequetteville Terrace, Kent Town.
1927. *HACKETT, Dr. C. J., 196 Prospect Road, Prospect, S.A.
1922. *HALE, H. M., The Curator, S.A. Museum, Adelaide.
1922. *HAM, WILLIAM, F.R.E.S., Teachers' College, North Terrace, Adelaide.
1916. †HANCOCK, H. LIPSON, A.M.I.C.E., M.I.M.M., M.Am.I.M.E., Bundarra Road, Bellevue Hill, Sydney.
1924. HAWKER, Captain C. A. S., M.A., North Bungaree, via Yacka, South Australia.
1896. HAWKER, E. W., M.A., LL.B., F.C.S., East Bungaree, Clare.
1928. HAWKER, M. S., Adelaide Club, North Terrace.
1923. HILL, FLORENCE MCCOY M., B.S., M.D., University of Adelaide.
1928. HIRST, A. S., F.L.S., University of Adelaide.
1926. HOLDAWAY, F. C., M.Sc., Ph.D., Farnham Royal, England.
1927. HOLDEN, E. W., B.Sc., Dequetteville Terrace, Kent Town, S.A.
1925. HOMBURG, Hon. H., M.P., Grenfell Street, Adelaide.
1924. *HOSSFELD, PAUL S., M.Sc., Rabaul, Territory of New Guinea.
1883. *HOWCHIN, Professor WALTER, F.G.S., "Stonycroft," Goodwood East, S.A.
1928. HURCOMBE, Miss J. C., 95 Unley Road, New Parkside.
1928. IFOULD, PERCY, Kurralta, Burnside.
1918. *ISING, ERNEST H., c/o Superintendent's Office, S.A. Railways, Adelaide.
1912. *JACK, R. L., B.E., F.G.S., Assistant Government Geologist, Adelaide.
1893. JAMES, THOMAS, M.R.C.S., 9 Watson Avenue, Rose Park.
1918. *JENNISON, Rev. J. C., Mallala, S.A.
1910. *JOHNSON, E. A., M.D., M.R.C.S., Town Hall, Adelaide.
1910. *JOHNSTON, Professor T. HARVEY, M.A., D.Sc., University of Adelaide.
1920. *JONES, F. WOOD, M.B., B.S., M.R.C.S., L.R.C.P., D.Sc., F.R.S., Honolulu.
1923. JUDELL, LESTER M. W., B.Sc., Jamestown.
1926. JULIUS, EDWARD, Conservator of Forests, Adelaide.
1918. KIMBER, W. J., 28 Second Avenue, Joslin.
1915. *LAURIE, D. F., Agricultural Department, Victoria Square.
1897. *LEA, A. M., F.E.S., South Australian Museum, Adelaide.
1884. LENDON, A. A., M.D., M.R.C.S., 66 Brougham Place, North Adelaide.
1922. LENDON, GUY A., M.B., B.S., M.R.C.P., North Terrace.
1925. LEWIS, A., M.B., B.S., Adelaide Hospital.
1927. *MACKLIN, E. D., Miss, M.Sc., The University, Adelaide.
1922. *MADIGAN, C. T., M.A., B.Sc., University of Adelaide.
1923. MAGAREY, W. A., LL.B., Pirie Street.
1923. MARSHALL, J. C., Darrock, Payneham.
1914. MATHEWS, G. M., F.R.S.E., F.L.S., F.Z.S., Foulis Court, Fair Oak, Hants, England.
1905. *MAWSON, SIR DOUGLAS, D.Sc., B.E., F.R.S., Professor of Geology, University, Adelaide.
1919. MAYO, HELEN M., M.D., 47 Melbourne Street, North Adelaide.
1920. MAYO, HERBERT, LL.B., Brookman Buildings, Grenfell Street.
1926. MCCOY, H. A., M.B., Ch.M., 163 North Terrace, Adelaide.
1920. MCGILP, JOHN NEIL, Napier Terrace, King's Park.
1907. MELROSE, ROBERT T., Mount Pleasant.
1928. MELVILLE, L. G., B.Ec., F.I.A., Public Actuary, Adelaide.
1924. MESSENT, P. S., M.S., 192 North Terrace.
1925. †MITCHELL, Professor SIR WILLIAM, K.C.M.G., M.A., D.Sc., The University, Adelaide.
1897. *MORGAN, A. M., M.B., Ch.B., 46 North Terrace.
1924. MORISON, A. J., Deputy Town Clerk, Town Hall, Adelaide.
1926. MOORE, A. P. R., D.DSc., 193 North Terrace, Adelaide.
1926. *MOUNTFORD, C. P., 42 Maria Street, Thebarton.
1921. MOULDEN, OWEN M., M.B., B.S., Unley Road, Unley.
1927. †MURRAY, Hon. SIR GEORGE, K.C.M.G., B.A., LL.M., Magill, S.A.
1925. NORTH, Rev. WM. O., Methodist Manse, Netherby.
1913. *OSBORN, T. G. B., D.Sc., Professor of Botany, University of Sydney.
1927. PALTRIDGE, T. B., B.Sc., Koonamore, via Waukaringa, S.A
1924. PEARCE, C., 33 Capper Street, Kent Town.
1924. PERKINS, A. J., Director of Agriculture, Victoria Square.
1926. PIPER, C. S., M.Sc., Waite Agric. Research Institute, Glen Osmond.
1925. *PRESCOTT, Professor J. A., M.Sc., A.I.C., Waite Agric. Research Institute, Glen Osmond.
1926. PRICE, A. GRENFELL, M.A., F.R.G.S., St. Mark's College, North Adelaide.
1907. †*PULLEINE, R. H., M.B., Ch.M., North Terrace, Adelaide.

Date of Election.

1916. *Ray, William, M.B.. B.Sc., Liberal Club Building, North Terrace, Adelaide.
1925. Richardson, Professor A. E. V., M.A., D.Sc., "Urrbrae," Glen Osmond, S.A.
1926. Riddell, P. D., Technical College, Broken Hill.
1911. Roach, B. S., Education Department, Flinders Street, Adelaide.
1919. *Robertson, Professor T. B., D.Sc., D.Ph., University of Adelaide.
1924. Roeger, Miss M. T. P., c/o Central School, Goodwood.
1925. Rogers, L. S., B.D.Sc., 192 North Terrace.
1905. *Rogers, R. S., M.A., M.D., 52 Hutt Street.
1922. *Samuel, Geoffrey, M.Sc., University of Adelaide
1924. Sandford, J. Wallace, 75 Grenfell Street.
1928. Scott, A. E., B.Sc., 143 Rundle Street, Kent Town.
1924. Segnit, R. W., M.A., B.Sc., Architect-in-Chief's Office, Victoria Square, Adelaide.
1891. Selway, W. H., Gilberton.
1926. *Sheard, Harold, Gawler.
1928. Showell, H., 27 Dutton Terrace, Medindie.
1920. Simpson, A. A., C.M.G., C.B.E., F.R.G.S., Lockwood Road, Burnside.
1924. Simpson, Fred. N., Dequetteville Terrace, Kent Town.
1925. †Smith, T. E. Barr, B.A., 25 Currie Street, Adelaide.
1906. Snow, Francis H., National Mutual Buildings, King William Street.
1923. Sprod, M. W., M.B., B.S., Moseley Street, Glenelg.
1927. Stapleton, P. S., Henley Beach, South Australia.
1922. Sutton, J., Fullarton Road, Netherby.
1925. Symons, Ivor G., Church Street. Highgate.
1928. Taylor, Violet, 40 Eton Street, Malvern.
1923. Thomas, J. F., Tenterfield, N.S.W.
1923. *Thomas, R. G., B.Sc., 5 Trinity Street, St. Peters, S.A.
1923. *Tindale, N. B., South Australian Museum, Adelaide.
1894. *Turner, A. Jefferis, M.D., F.E.S., Wickham Terrace, Brisbane, Queensland.
1925. Turner, Dudley C., National Chambers, King William Street, Adelaide.
1878. *Verco, Sir Joseph C., M.D., F.R.C.S., North Terrace, Adelaide.
1926. Wainwright, J. W., B.A., 32 Florence Street, Fullarton Estate.
1924. Walker, W. D., M.B., B.S., B.Sc., c/o National Bank, King William Street.
1912. *Ward, Leonard Keith, B.A., B.E., D.Sc., Government Geologist, Adelaide.
1920. Weidenbach, W. W., A.S.A.S.M., Geological Department, Adelaide.
1904. Whitbread, Howard, c/o A. M. Bickford & Sons, Currie Street.
1912. *White, Capt. S. A., C.M.B.O.U., "Wetunga," Fulham.
1920. *Wilton, Professor J. R., D.Sc., University of Adelaide.
1923. *Wood, J. G., M.Sc., University of Adelaide.
1927. Woodlands, Harold, Box 989 H, G.P.O.
1927. Woollard, H. H., M.D., Professor of Anatomy, University of Adelaide.

ROYAL SOCIETY OF SOUTH AUSTRALIA
(INCORPORATED).

SECTION III.—PAPERS.

(Approved October 8, 1923.)

1. No paper which has not been previously approved by the Council shall be brought before the Society.

2. Every paper brought before the Society shall be immediately delivered to the Secretary.

3. The Council shall at its next or at a subsequent meeting decide whether such paper will be published.

4. If the Council decides to publish the paper in whole or in part, it and all copyrights thereof shall become the property of the Society, such copyrights to include all plates, maps, diagrams, and photographs reproduced in illustration of the paper; and all blocks used in such reproductions shall be the property of the Society. All manuscripts and original illustrations must be returned to the Editor with the corrected proofs.

5. All matter used in illustration of papers (whether photographs, prints, negatives, or drawings) remains the property of the authors. The illustrations shall be returned to the Secretary by the printer on publication of the volume, and shall be kept by him in safe custody for one year, unless previously claimed by the author. After the expiration of one year they may be disposed of as the Council shall direct.

6. If the Council decides not to publish a paper, either in whole or in part, the same shall be returned to the author, if he so desires.

7. All papers and other contributions published by the Society shall be subjected to editing by the Editor.

8. The author of any paper published by the Society shall be entitled to receive free of cost 25 copies of the same, and to obtain additional copies (not exceeding 75, unless the Council shall determine otherwise) upon paying the extra cost thereof. Every such copy shall include a statement that it is taken from the publications of the Society.

9. All contributions and excerpts intended for publication by the Society shall be clearly typed or written on one side of the paper only, and in accordance with the "Suggestions for the Guidance of Authors" published by the Society, ready for the printer.

10. A proof shall be submitted (if possible) to the author, who shall be allowed to make any slight amendments without cost, but if the corrections are excessive they must be paid for by him.

11. In order to secure correct reports, all papers and other contributions laid before the Society must be accompanied by short abstracts.

ROYAL SOCIETY OF SOUTH AUSTRALIA
(INCORPORATED).

SUGGESTIONS FOR THE GUIDANCE OF AUTHORS IN THE PREPARATION OF MSS. TO BE SUBMITTED TO THE SOCIETY.

1. The manuscript must be clearly written (especially in the case of scientific and technical terms), and in a form ready to be placed in the hands of the printer. It is a great advantage for MSS. to be typed. If the paper be illustrated, the illustrations, maps, etc., must be supplied in a form ready for reproduction. It may be necessary to return MSS. to authors for typing. In returning proofs to the Editor, the original copy should be included.

2. Uniformity must be preserved throughout in the use of capital letters, italics, abbreviations, punctuation, etc.

3. All generic and specific names must be underlined (denoting italics). Other scientific nomenclature must be in roman. Generic names must begin with a capital letter, and specific and varietal names (even where a proper name is used) must begin with non-capitals, as, for example, *Lovenia forbesi* T. Woods. (An exception to this rule is made in the case of botanical names, where the usage is to retain the capital letter in proper names.)

4. Diphthongs are not allowed; each vowel must be written separately, as, for example, Archaeocyathinae.

5. In the case of original descriptions the following abbreviations should be used: n. gen., n. sp., n. var.

6. Authors and authorities, following a name in roman, must be in italics; following a name in italics, to be in roman; when the species is transferred to another genus the name of the original author to be enclosed in parentheses. (No comma shall appear between the specific name and the name of the author.)

7. The names of Australian States are to be written in full in the text, but in the footnotes and synonymy are to be abbreviated as follow:—Australia, Aust.; New South Wales, N.S.W.; Victoria, Vict.; Tasmania, Tasm.; South Australia, S. Aust.; Western Australia, W. Aust.; Queensland, Qld.; North Australia, N. Aust.; Central Australia, C. Aust.; New Guinea, N. Guin.; New Zealand, N.Z.; Federal Capital Territory, F.C.T. Aust.

8. Symbols or abbreviations used to save trouble in writing, but not intended to appear as such in the printed text, are not allowable.

9. The maximum size of illustrations (maps excepted) to be $7\frac{1}{2}$ inches x 5 inches for plates, and $7\frac{3}{4}$ inches x 5 inches for text figures.

Note regarding Abstracts.—The author is requested to supply two brief abstracts of his paper—one for local use, and another, not exceeding 50 words, to be sent to publications which cannot grant more space.

APPENDIX.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia (Incorporated).

FORTY-FIFTH ANNUAL REPORT OF THE COMMITTEE
FOR THE YEAR ENDED AUGUST 31, 1928.

The Committee has pleasure in presenting the following report for the information of members:—

MEMBERSHIP.—The number on the roll at the close of last year was 179, of whom 138 were financial. The total this year is 188, and of this total 118 are financial. The new members admitted during the twelve months total 31, while the losses by death and resignation have been 22.

EXCURSIONS.—During the year 27 excursions have been held, and the means of transport has been by tram, train, launch, and charabanc. The subjects studied have been Botany, Aquatic Biology, Entomology, Geology, Cultivated Native Plants, Marine Dredging, Ornithology, Conchology, Fruit Culture, Physiography, Orchids, Wattles, Australian Trees, and general subjects.

LECTURES.—The following gave lectures, some with lantern slides, and others with various exhibits:—Mr. T. P. Bellchambers on "The Life History of the Mallee Fowl"; Dr. C. A. E. Fenner, "Petrological and Chick Development." Microscope Slides: Mr. W. A. Harding, "Floral Organs," etc.; Mr. H. M. Hale, Crustaceans, etc.; Rev. A. H. Gunter, "Foraminifera"; Mr. F. B. Collins, "Histology," Mr. J. W. Hosking; "Aquatic Plants"; and Mr. Wilson, "Water Flea"; Mr. C. T. White, F.L.S., Government Botanist of Brisbane, on "Rain Forests of Queensland and New Guinea"; Sir William Sowden, "Penology"; Professor J. B. Cleland, "Botany"; Mr. E. H. Ising, "Botany"; Mr. W. Ham, "Tasmanian Physiography"; Mr. W. J. Kimber, "Life on a Coral Island"; Mr. P. H. Williams, "Peeps in other Lands"; Mr. A. G. Edquist, "Our Birds."

"THE SOUTH AUSTRALIAN NATURALIST."—Our journal has been issued regularly every quarter, and many interesting articles have been published. With the issue of No. 4 this month, Volume IX. will be completed. Amongst those contributing have been Professor J. B. Cleland, who has continued his articles on "The Plants of the Encounter Bay District"; Messrs. H. M. Hale and P. S. Hossfeld, B.Sc., on "Meterological Notes"; Mr. H. M. Hale, "Aquarists in Camp"; Mr. P. S. Hossfeld, "Ethnological Notes"; Mr. W. J. Kimber, "A Holiday on Coral Islands"; Mr. N. B. Tindale, "Native Rock Shelters"; Mr. J. Sutton, "Birds of National Park"; Mr. J. T. Cunningham, "Coral Isles" (poetry); Dr. C. A. E. Fenner, F.G.S., "A Study in Human Geography." Also, reports from the South Australian Aquarium Society and the Shell Collectors' Committee, and of Lectures and Excursions. The Editor (Mr. W. Ham) has maintained the issue of the journal with conspicuous success. He would, however, welcome more articles from members, especially those dealing with original observations. The cost of printing Volume IX. amounted to £43 12s. 6d.

Exchanges.—Local, Interstate, and extra-Australian publications have been regularly received, and are available to the members.

Flower Show, 1927.—The Ninth Annual Wild Flower Show and Natural History Exhibition was held in the Adelaide Town Hall on September 23 and 24, 1927, and proved very successful. The net proceeds amounted to £45 7s. 7d. We are indebted to the Lord Mayor—who made the official opening—and to a large number of members and friends, both local and Interstate, for assisting in the Show. Special credit is due to the many teachers and scholars in the country districts, chiefly, who collected and forwarded the flowers which made the Exhibition possible.

Herbarium.—The work in connection with the Herbarium has been well maintained under the energetic guidance of Professor J. B. Cleland, and a number of members have attended and carried out such work as drafting, sorting, and mounting specimens. The work of painting specimens with a poison, so as to kill insects attacking them, has been commenced. A number of specimens were pressed from among the collections sent by schools for the last Show, and by this means many good specimens were obtained. In fact, a new species of *Olearia* and other rare specimens were sent from Burrungul School. Among some specimens sent by Mr. F. D. Warren, of Finniss Springs, via Marree, were two new species, viz., *Stipa nitida,* a spear grass, and *Swainsona adenophylla.* Mr. J. M. Black has made use of the Herbarium in compiling his "Flora of South Australia."

Obituary.—The loss of Mr. Edgar R. Waite was a severe blow to the Section, as he was an invaluable worker and helper at all times. He gave lectures, conducted members through the Museum on a number of occasions, wrote articles for our journal, and helped with exhibits, etc., at all our Wild Flower Shows. We regretfully record the loss of Mr. W. J. Webb, who was a member for some years, and who was a keen microscopist, and lent his microscope a number of times. Mr. Webb was one of our most regular members at the Excursions and was a valuable helper at our Wild Flower Shows. Mrs. E. Drummond's death occurred recently on board ship, while on her way back to Australia. She was a member for several years.

Charabanc Trips.—The poor attendance, and the consequent loss on these trips, is giving the Committee much anxiety, especially as there are still four arranged, and which are definitely engaged. Will members endeavour to go to these trips and prevent further loss to the Section? With greater efforts on the part of all the members much more useful work can be accomplished, and the Committee trust that the members will co-operate with them to this end.

Library.—During the year the Librarian, Miss I. Roberts, resigned through pressure of work, and the Committee placed on record her valuable services while in charge of the Library, and we were sorry to lose her. Miss M. Roeger was appointed to the position. A new cupboard has been purchased costing £5 5s., and this will give more room to display our books. We now have a valuable set of books, and it is hoped that members will make full use of them. They are available on application for home reading to the Librarian from 7.30 p.m. on the night of meetings, and at other times by arrangement.

(Signed) W. Champion Hackett, *Chairman.*
Ernest H. Ising, *Hon. Sec.*

FORTIETH REPORT OF THE FLORA AND FAUNA PROTECTION COMMITTEE

FOR THE YEAR ENDED AUGUST 31, 1928.

During the year three meetings of the Committee have been held.

It is pleasing to report that, following upon much correspondence and representatives waiting on and conferring with responsible officers of the Central Agricultural Bureau, some definite assurance has been given that steps will be taken to preserve the Native Currant *(Acrotriche depressa)* from destruction. Already notices have been prepared by Government departments warning persons against pulling up the bushes. These will be posted conspicuously. The resolution sent on to the Minister reads:—

(1) That the Crown Lands Department be requested to take steps to ensure the protection of the bushes of the Native Currant *(Acrotriche depressa)* on Crown lands by the addition of a suitable clause in the agreement; also by having notices posted on Crown lands in the Barossa and other districts, such notices warning persons against destroying the bushes. Also that private owners of land on which the currant grows be requested to co-operate by posting similar notices on their property.

(2) That the Crown Lands Department be asked to co-operate with local branches of the Agricultural Bureau and with the District Councils concerned, in an endeavour to protect the Native Currant from destruction.

Other matters considered during the year included the question of saving the Grey Kangaroos, at present to be found on certain sections of the Adelaide hills, from total extinction.

(Signed) S. A. WHITE, *Chairman.*
J. E. LEWIS MACHELL, *Hon. Sec.*

SHELL COLLECTORS' COMMITTEE.

THIRD ANNUAL REPORT.

This Committee had a successful year and much useful work was accomplished. Twenty-five members are on the roll, with an average attendance of eighteen. Attention was given in the early part of the year to the completion of a preliminary survey of the Gasteropoda (univalves). Several special evenings were devoted to the study of the Scaphopoda (tooth shells), Polyplacophora (chitons), Cephalopoda (cuttlefish), also the Brachiopoda (lamp shells). At present the Committee is engaged on the Pelecypoda (bivalves). During the year members collected from widely separated beaches, including those of other States, and much useful material was obtained from this source.

(Signed) W. J. KIMBER, *Chairman.*
F. TRIGG, *Hon. Sec.*

MICROSCOPE COMMITTEE.

First Annual Report.

For a considerable time past it has been felt by some of the members of the Field Naturalists' Section that certain aspects of their activities have been unable to find expression owing to the unfortunate lapse of the Microscope Committee some years ago.

As most of the members' studies cannot be considered complete without a consideration of the minute, several members of the Section met and decided to endeavour to re-form the Microscope Committee, which had done such yeoman service under the inspiration of the late Mr. Bradley.

This quiet beginning has developed from three or four members to about a dozen. The subjects covered ranged from Foraminifera to Histology, and though of necessity elementary in scope so as to prove of interest to members not freely conversant with technical details, have, nevertheless, been full enough to permit further insight as to the minuter aspects of their favourite subjects.

Also, the meetings enable members to obtain a superficial but intelligent survey of subjects other than their own specialisations.

It is pleasing to report that several members of undoubted technical ability have promised to give lectures in the coming year, and an appeal is made to all members of the Section who have any knowledge of microscope work to link up with members of the Committee, and so strengthen with their presence and prestige an aspect of the Field Naturalists' Section's work that is really of fundamental and vital importance.

Meetings are held in the Royal Society's Rooms on the last Tuesday evening of each month, and ample opportunity will be given new members to acquire a knowledge of microscopic technique and procedure. All lectures delivered are amply illustrated with suitable slides, specimens, etc., and thus entertaining as well as instructive evenings are promised all members who can link up.

The thanks of the Committee are tendered to the Royal Society for the use of the Room and the Society's instruments.

(Signed) W. A. Harding, *Chairman.*
F. B. Collins, *Hon. Sec.*

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Statement of Receipts and Expenditure for the Year ended August 31, 1928.

GENERAL ACCOUNT.

Receipts.	£ s. d.	£ s. d.
1928—Aug. 31.		
To Balance carried forward, 1/9/28		19 13 7
„ Subscriptions		47 5 0
„ Other Receipts—		
Grant from Royal Society	50 0 0	
Flower Show Profit	45 7 7	
Bank Interest	1 15 9	
Aquarium Society Donation	1 1 0	
Sales "S.A. Naturalist"	0 10 3	
Sale of Badges	0 15 0	
		99 9 7
Grand Total		£166 8 2

Expenditure.	£ s. d.	£ s. d.
1928—Aug. 31.		
By Printing	55 6 9	
„ Advertising	4 10 11	
„ Postage	5 17 9	
„ Hire of Hall, etc.	7 1 5	
„ Travelling Expenses	2 1 8	
„ Stationery, Books, etc.	5 0 9	
„ Library Bookcase	5 5 0	
„ Sundries	0 17 1	
„ Repayment and Subs. to Royal Society	47 5 0	
„ Loss on Exc. Account	10 1 6	
		143 7 10
„ Bank Balance, 31/8/28		23 0 4
Grand Total		£166 8 2

Audited and found correct,

WALTER D. REED, F.C.P.A., } Hon.
ALEX. J. MORISON, } Auditors.

F. TRIGG, Hon. Treasurer.

August 31, 1928.

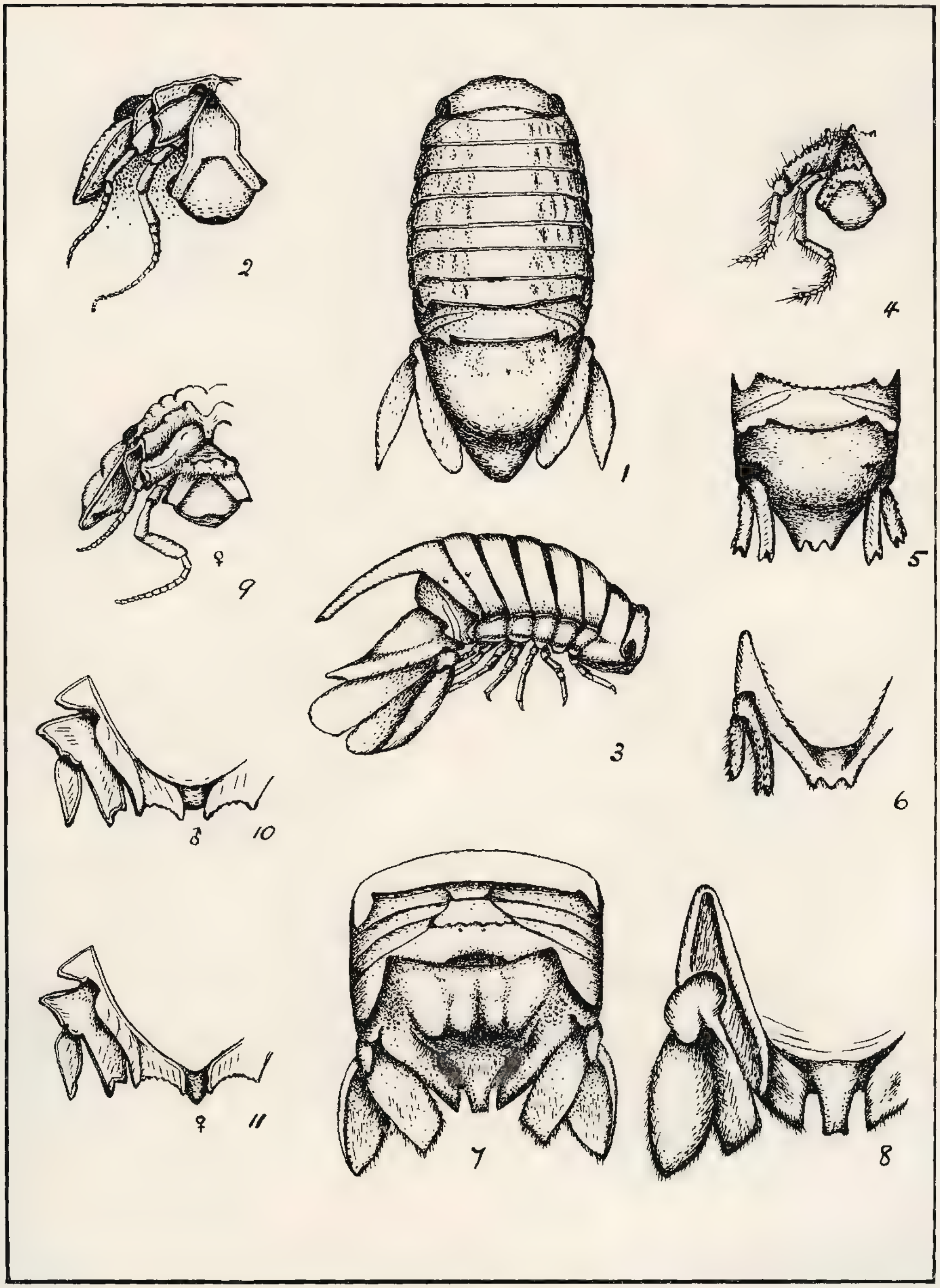
ROYAL SOCIETY OF SOUTH AUSTRALIA.

INDEX TO THE TRANSACTIONS, ETC., VOLS. XXV.-XLIV.

ADDENDA (omissions from Index).

GENERAL INDEX.

[Generic and specific names in italics indicate that the forms described are new to science.]



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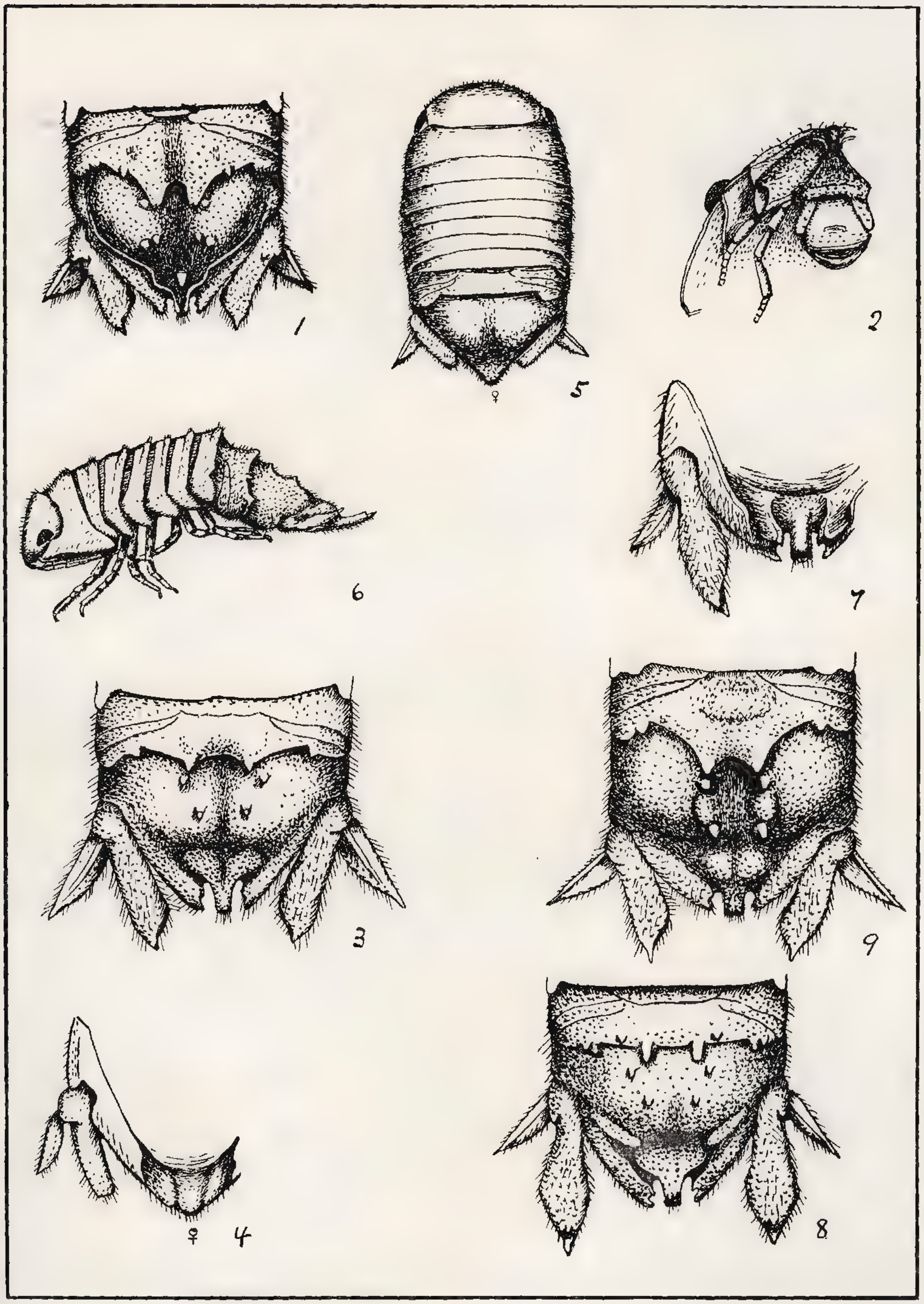

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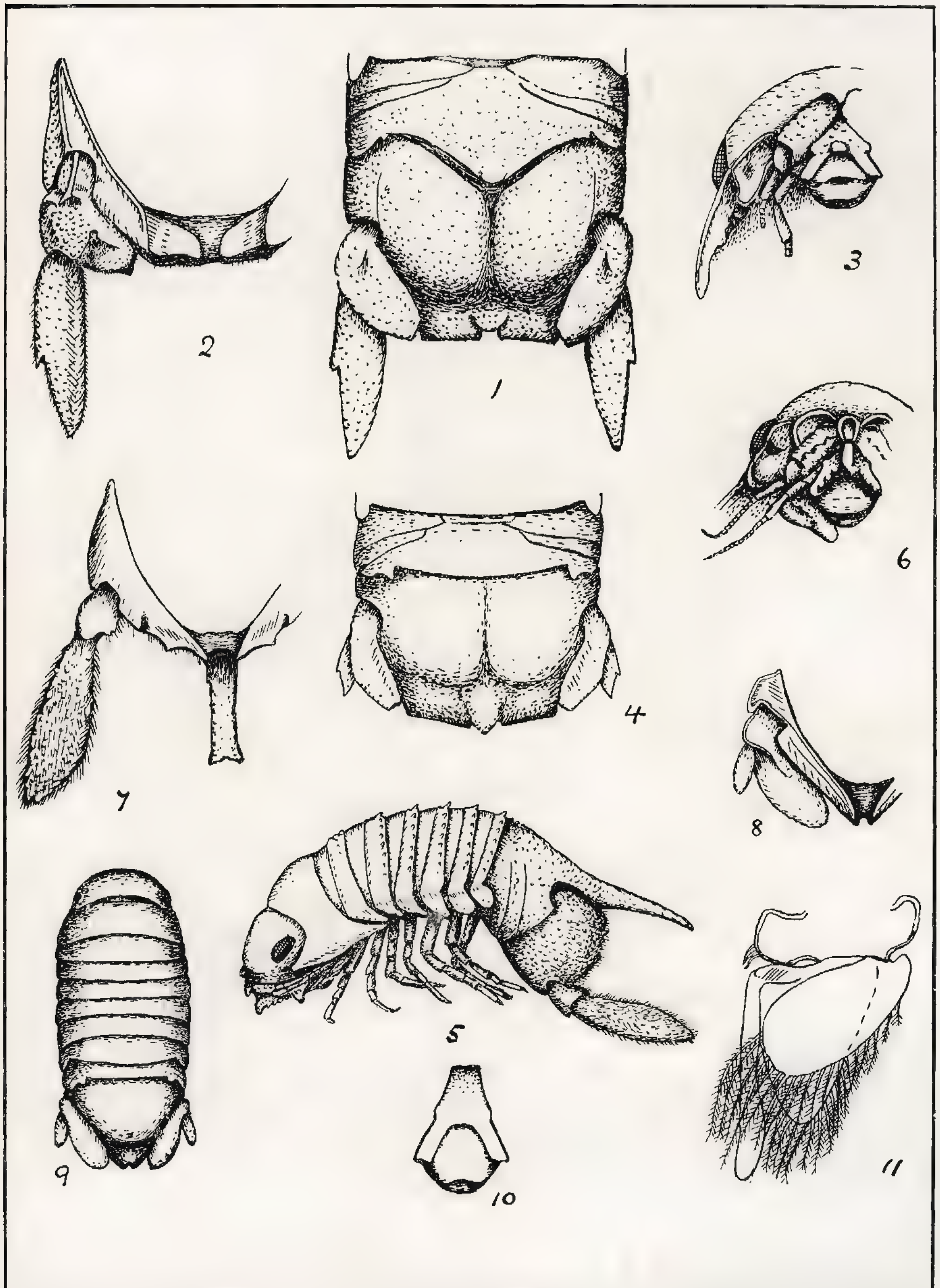

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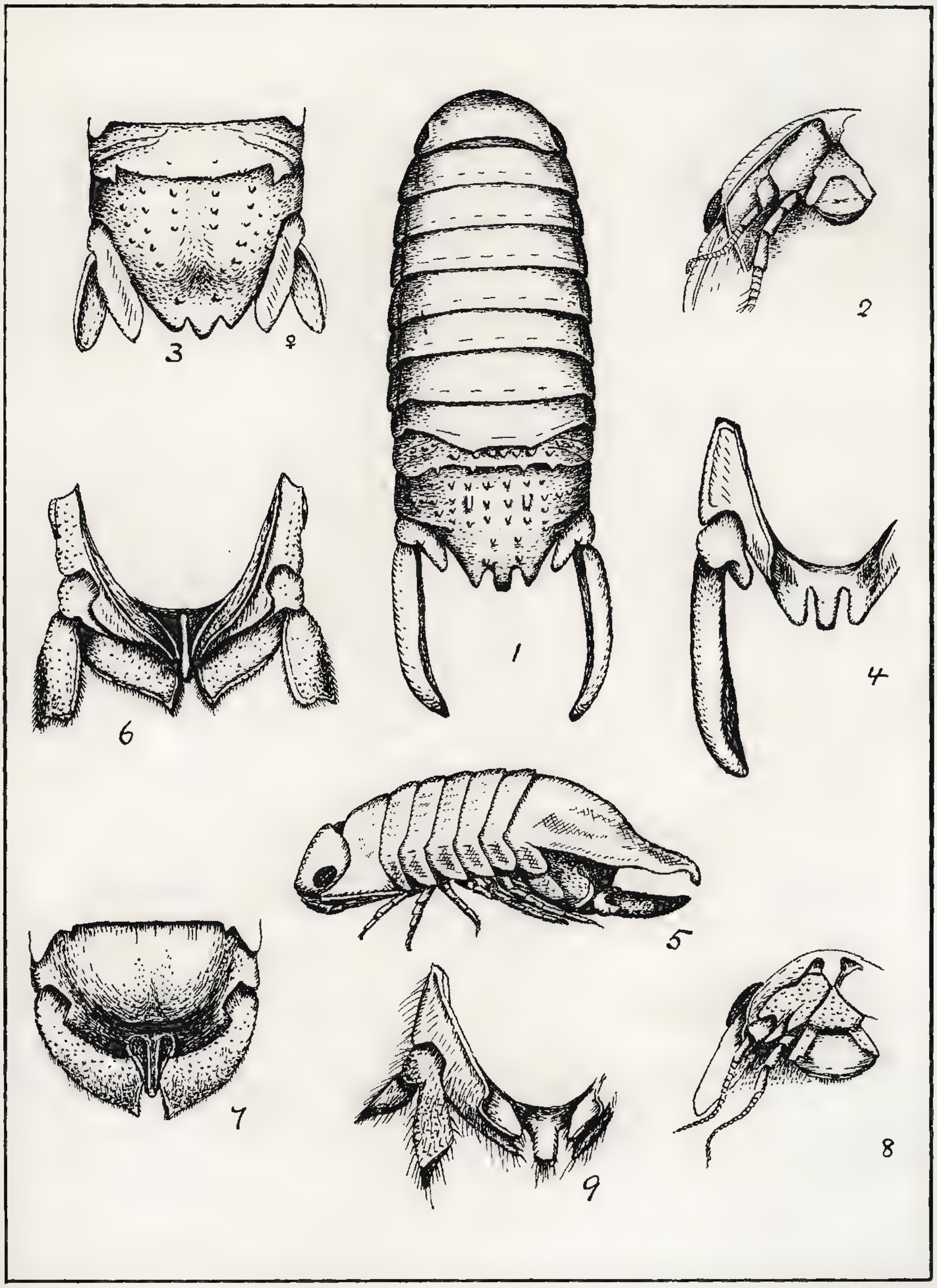

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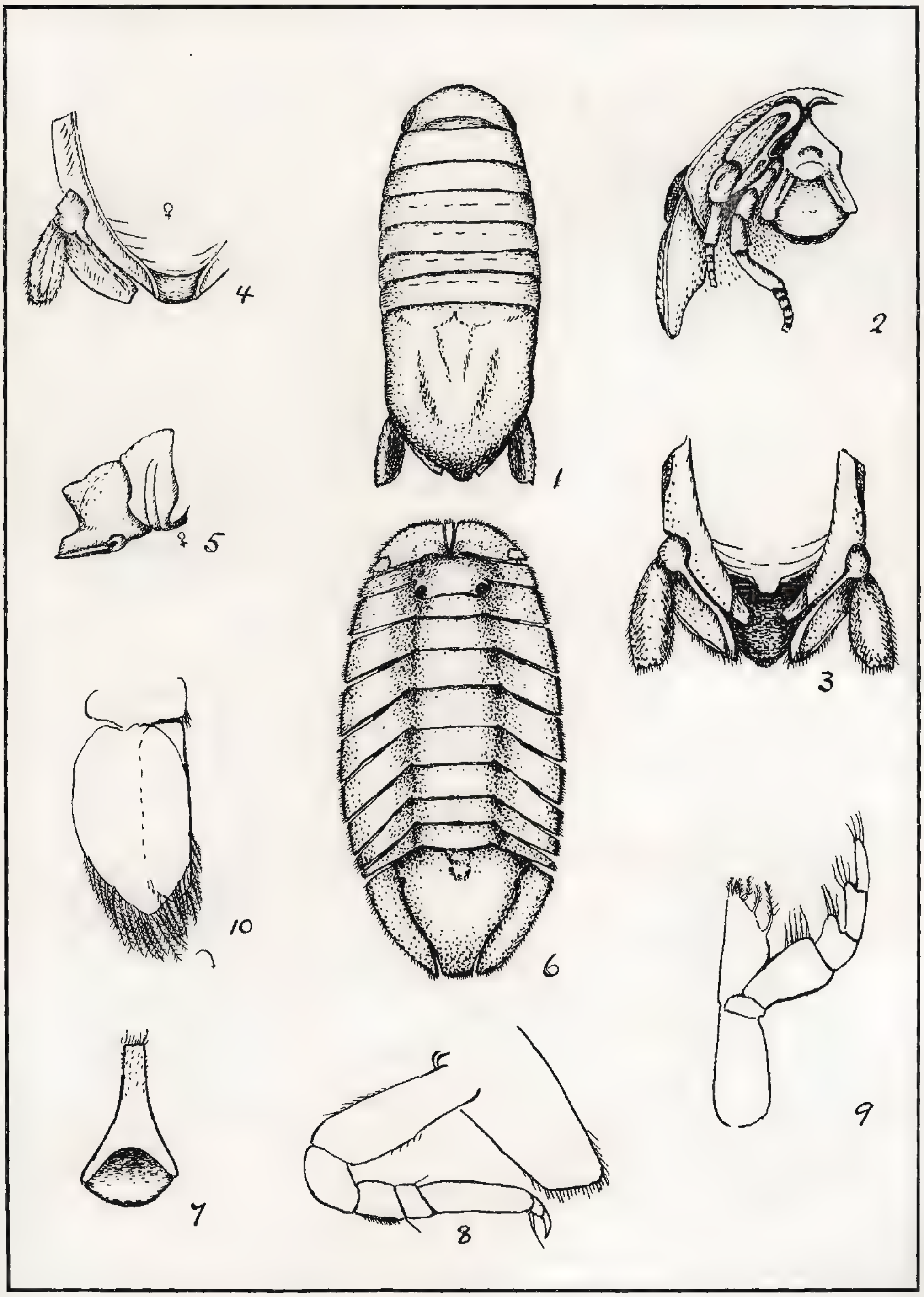

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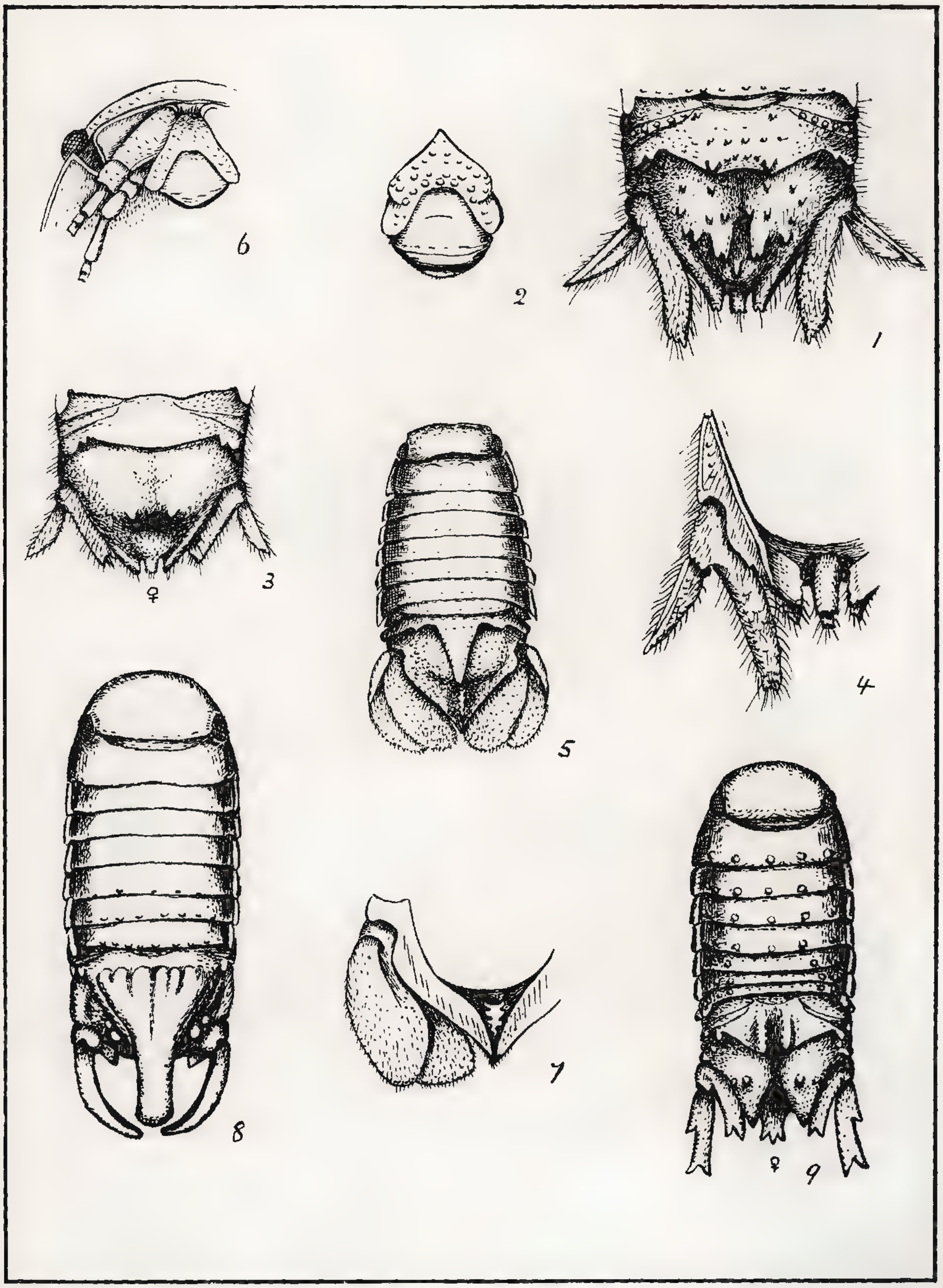

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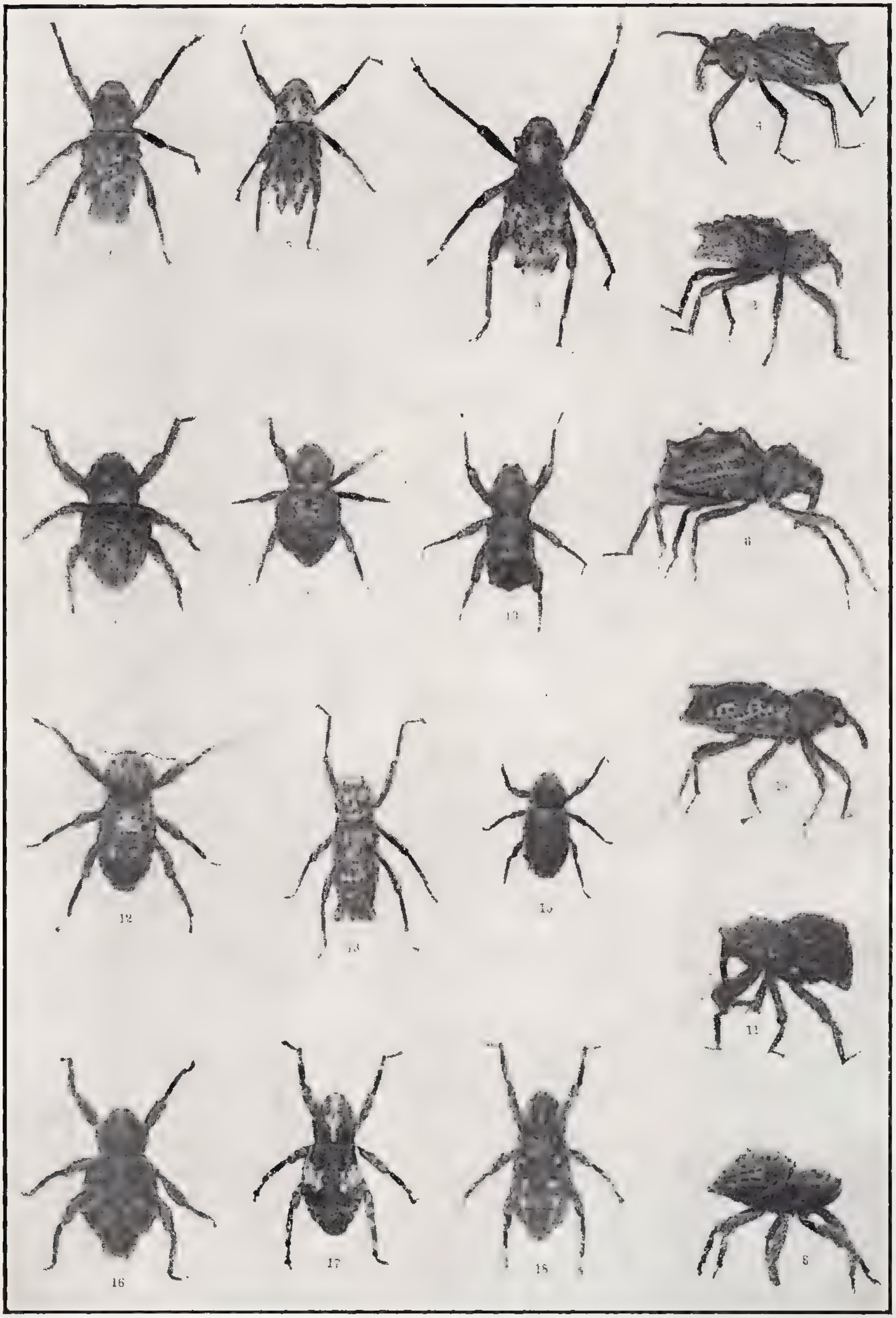

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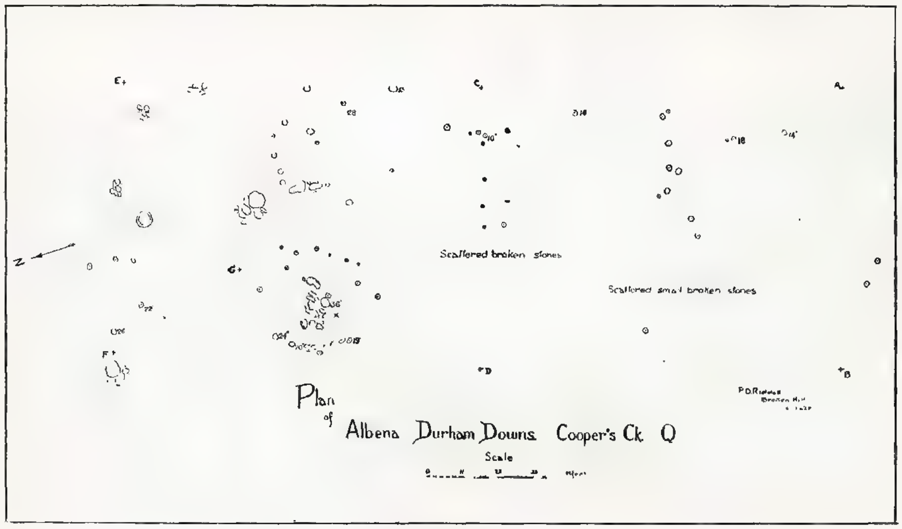

Fig. 1.

Fig. 2.

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Fig. 1.

Fig. 2.

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E. Ashby, Photo.

Australian Polyplacophora

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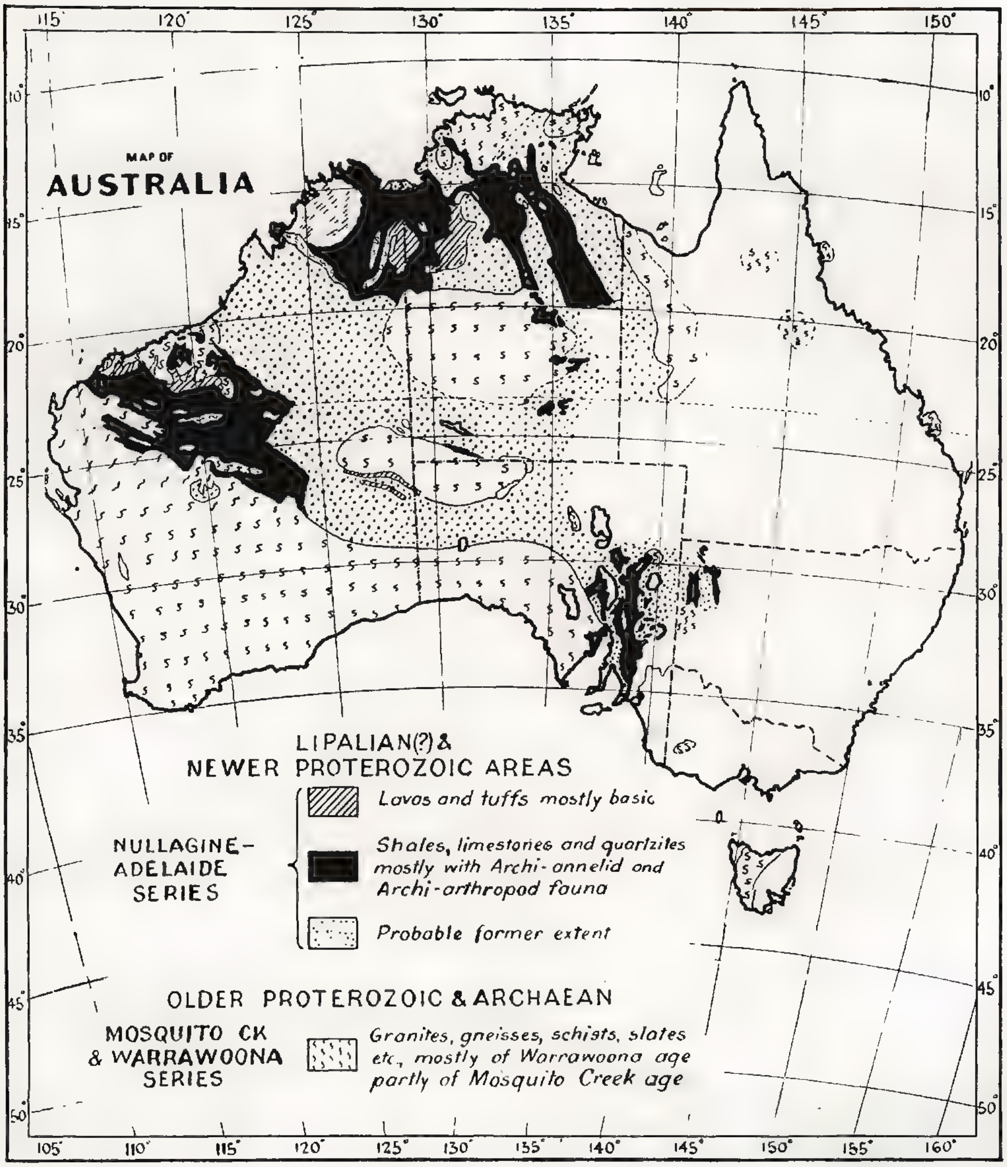

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Fig. 1

Fig. 2

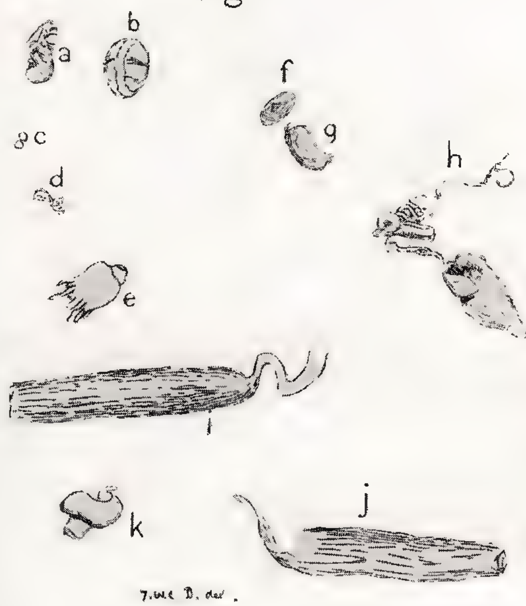
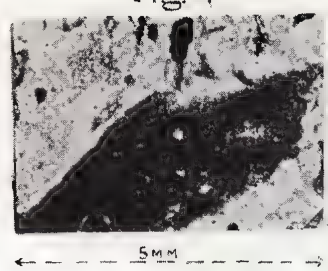


Fig. 3

Fig. 4



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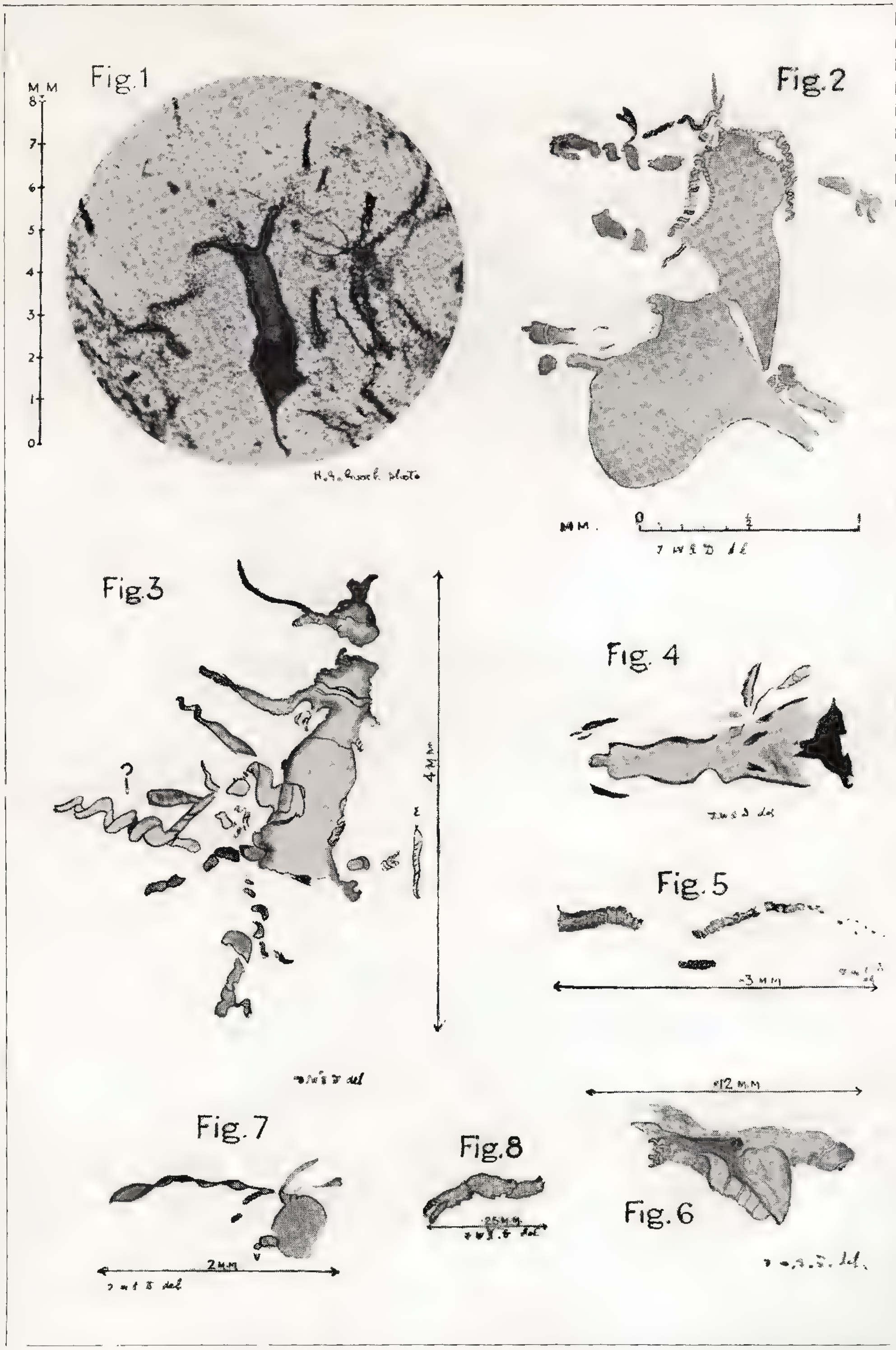

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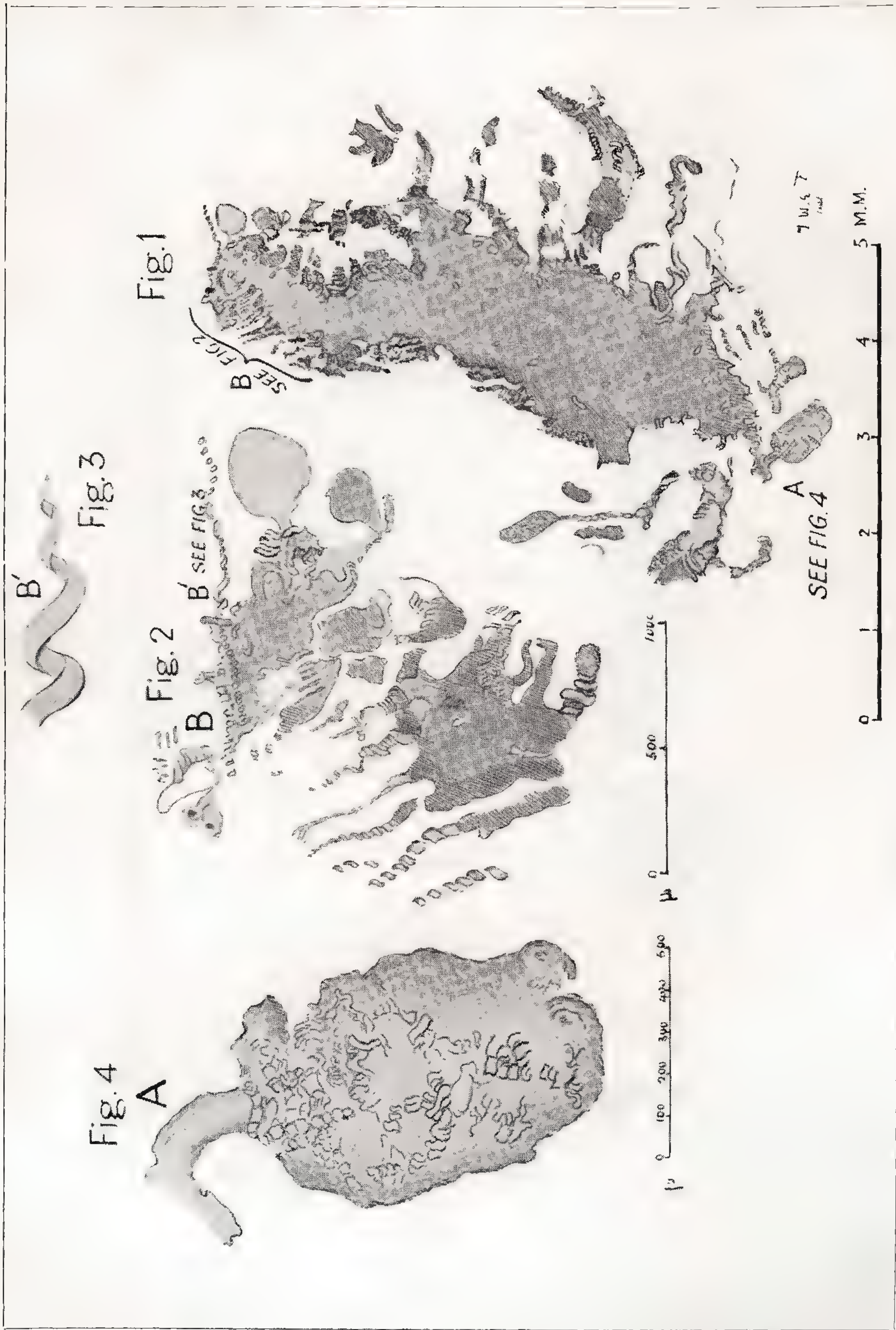

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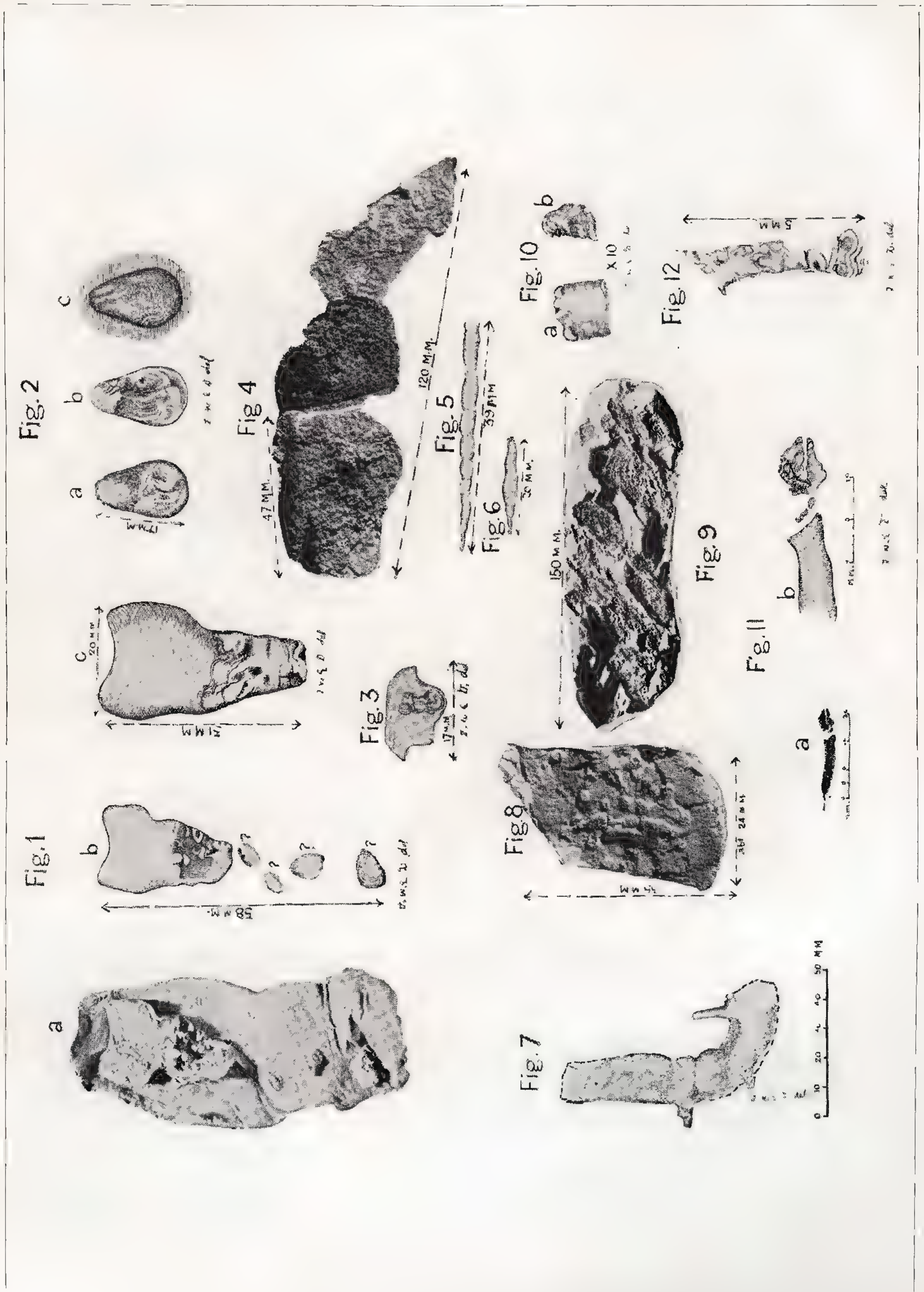

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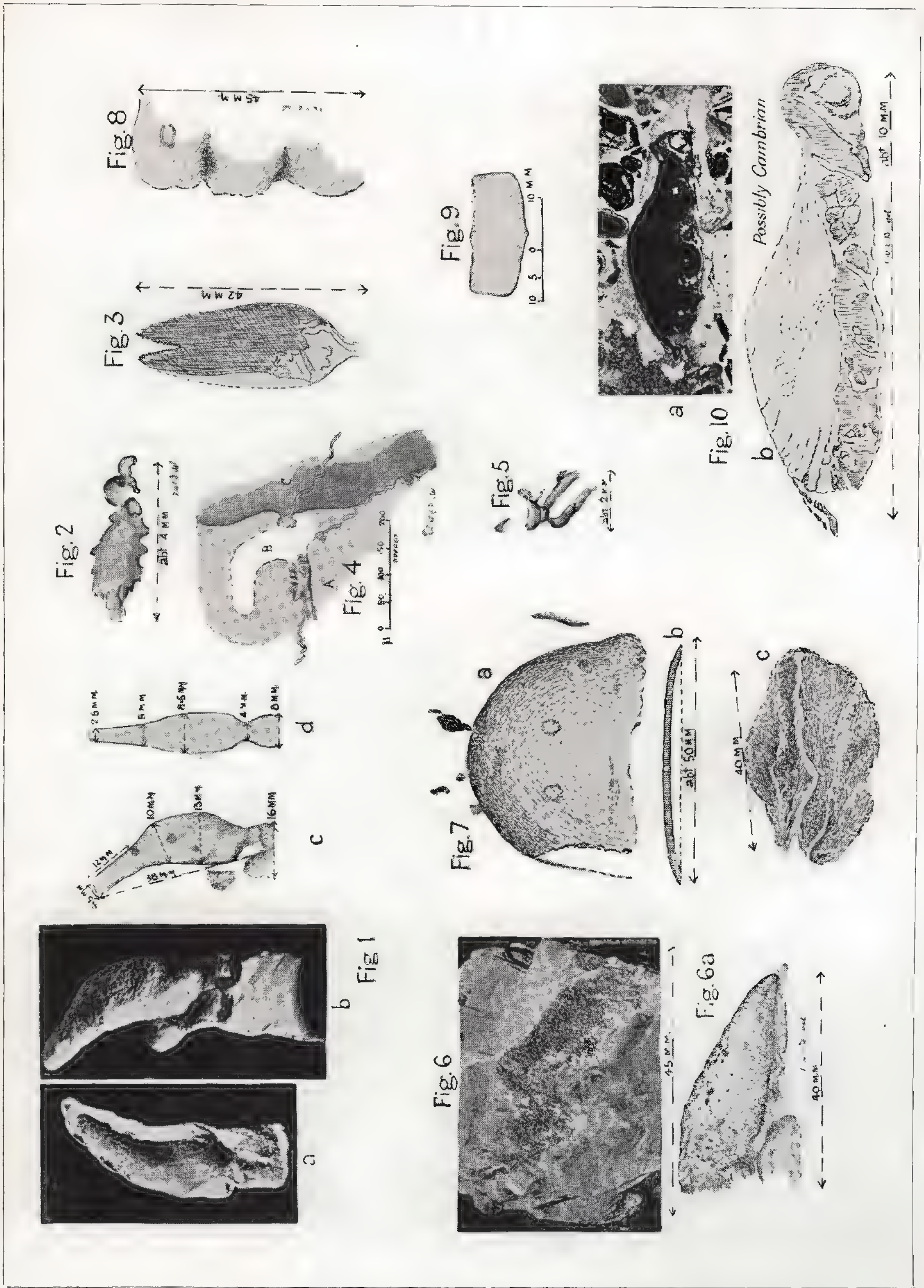

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Fig. 1.

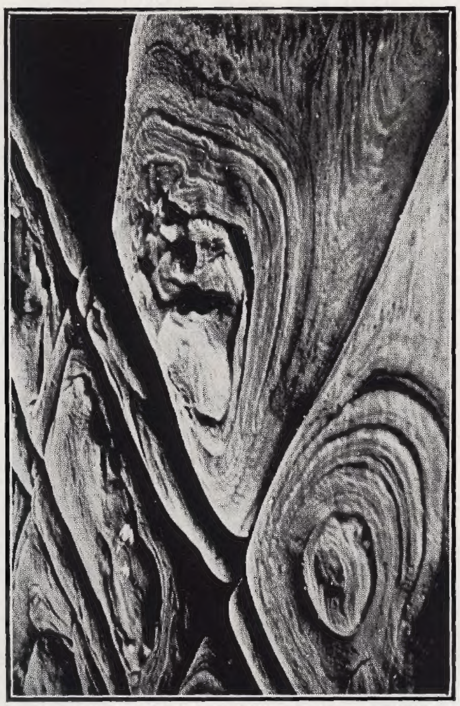

Fig. 2.

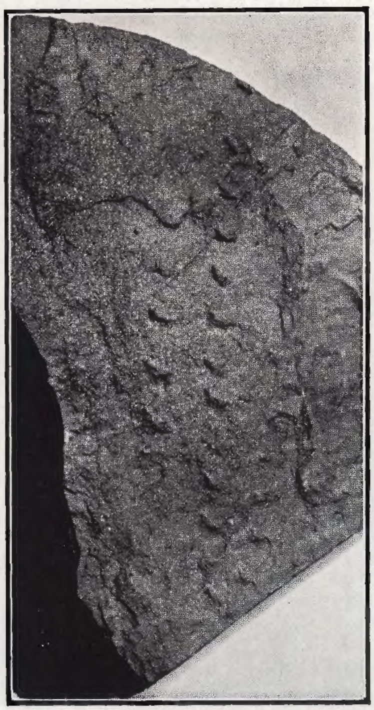

Fig. 3.

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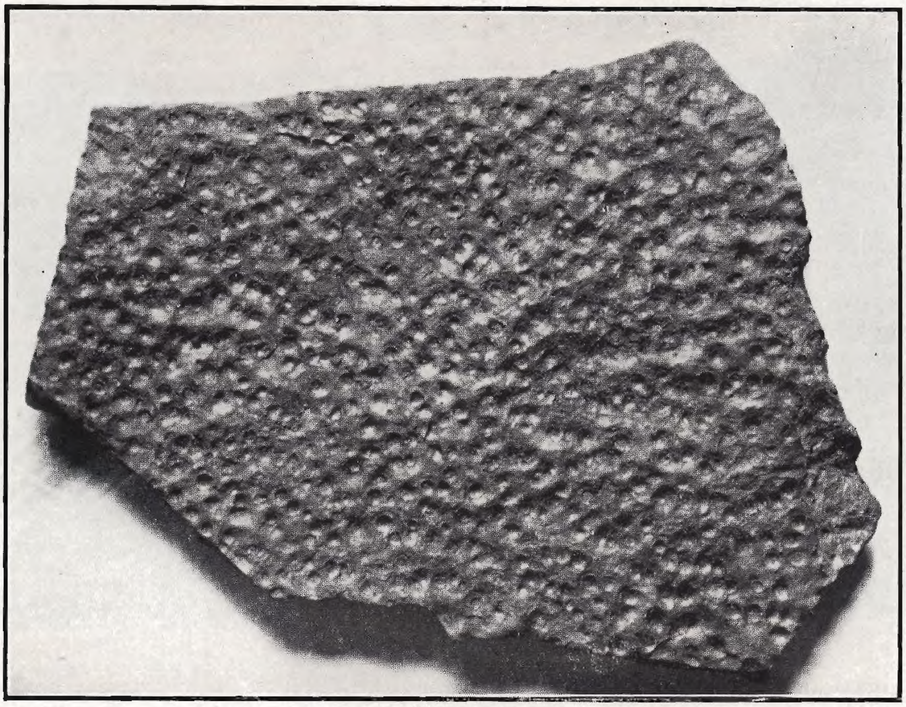

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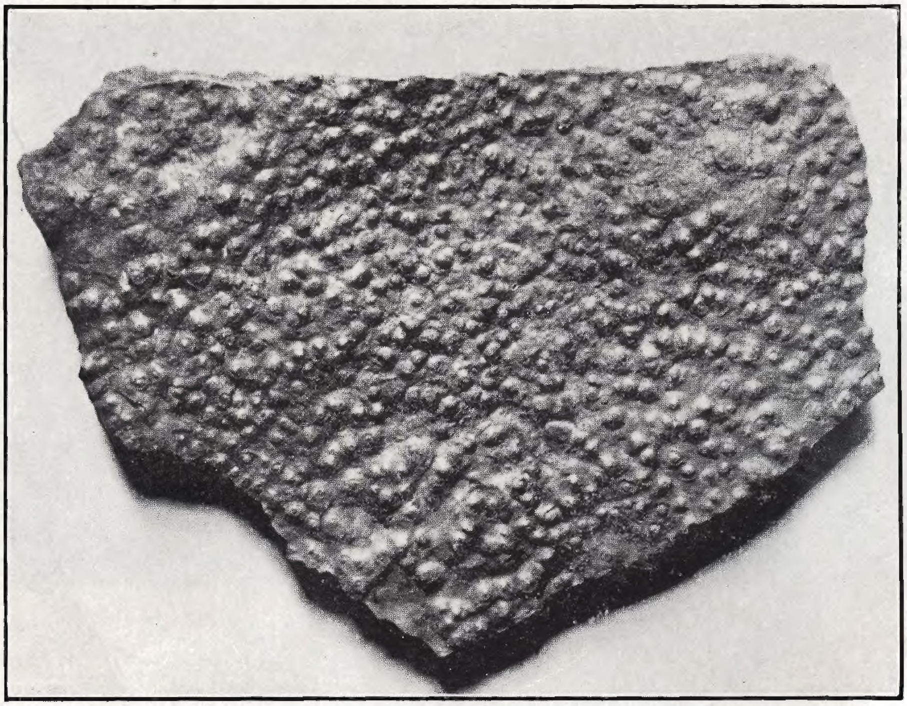

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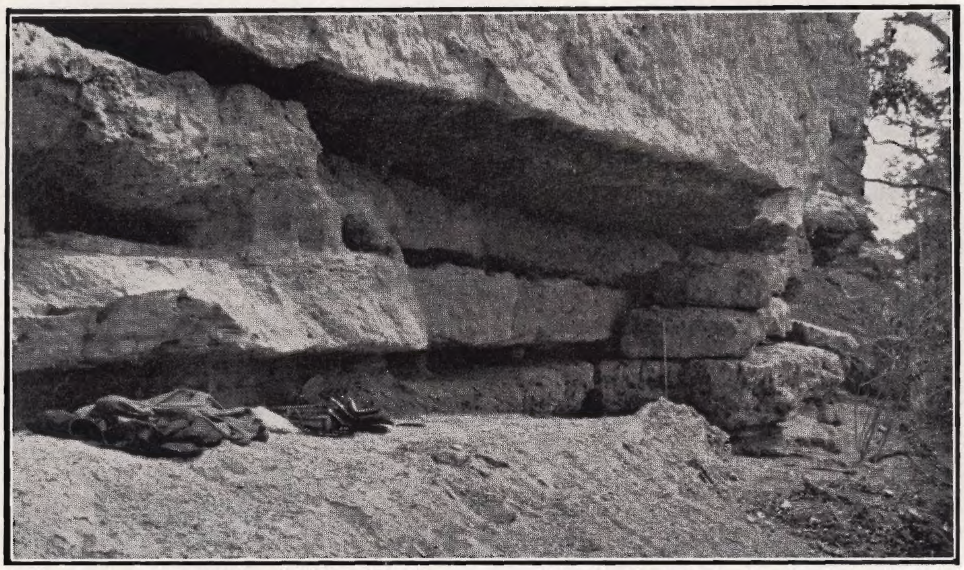

Fig. 1. "Haylands" Rock Shelter, River Murray.

Fig. 2. Paintings in above Shelter.

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CONTENTS.

ADDENDUM.

Page 60. Seventeenth line from top, after **Syncassidina**, add **aestuaria**.